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C. A. B.
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Plant Breeding Abstracts

Vol. XXIX, No. 2

STATISTICS

922 Corsten, L. C. A.
Vectors, a tool in statistical regression theory.
Meded. LandbHoogesch., Wageningen 1958 : **58** : 1–92.

A detailed mathematical exposition of ways in which linear algebra can be used to develop statistical theory and to assist in the statistical analysis of experimental designs is presented.

923 Martin, L.
Expérimentation factorielle et analyse des surfaces de réponse. (**Factorial experimentation and analysis of response surfaces**).
Publ. Inst. belge Amélior. Better. 1957 : **25** : 209–66.

An extension of factorial analysis to the construction and analysis of response surfaces for experiments of the type $r \times s$ is described in detail. The absence of interaction is indicated by a plane surface; interaction is indicated by a ruled surface. The account of exploration of the response surface follows that of Box and Wilson [cf. XXII, 2369*].

924 Müller, K.-H.
Einfache Auswertungsmöglichkeiten von Versuchen mit fehlenden Angaben. (**Simple possibilities for evaluating trials with missing entries**).
Z. landw. Vers.- UntersuchWes. 1957 : **3** : 391–400.

It is shown, by means of model experiments, how estimates of missing data can be calculated so that trials so affected can be evaluated by analysis of variance.

925 Bätz, G.
Zu einigen Fragen der Anlage und Auswertung mehrjähriger Sortenversuche. (**On some questions of the design and evaluation of several-year varietal trials**).
Z. landw. Vers.- UntersuchWes. 1957 : **3** : 407–23.

The substance of this paper has been summarized from another source [cf. XXVIII, 2718].

GENETICS

Proceedings of the X International Congress of Genetics, McGill University, Montreal, Canada, August 20–27, 1958 : 2 : Pp.339. (Absts.).

926 *Adati* [*Adachi*], *S. Cytogenetics of Japanese wild forage* Miscanthus *species.* (*pp. 1–2*).

The basic chromosome number of *Miscanthus* is postulated as $x = 19$, a polyploid series of 2, 3, 4, 5 and $6x$ having been identified. The diploid species *M. sinensis, M. japonicus* (= *M. floridulus*), *M. tinctorius* and *M. oligostachyus* are very similar caryotypically, with one pair of long (cs) chromosomes each with an intercalary trabant. Triploid *M. sinensis* var. *condensatus* has three cs chromosomes. Plants ranging in $2n$ number from 38 to 46 have been obtained by pollinating var. *condensatus* by diploids. Triploid, tetraploid and pentaploid representatives of *M. sacchariflorus* have been identified. The tetraploids are of common occurrence and, since they have one pair of cs chromosomes, are assumed to be allotetraploids. Two types of triploids have been found: one sterile with two cs chromosomes, the other (*M. sacchariflorus* var. *brevibarbis*) also sterile with one cs chromosome. The pentaploids (*M. saccharifolius* f. *latifolius*) are very vigorous and have four cs chromosomes. *M. intermedius* is autohexaploid with six cs chromosomes.

927 *Alexander, D. E. Genetic induction of autotetraploidy in maize.* (*p. 3*).

Plants homozygous for the recessive gene "elongate" (*el*) produce both reduced and unreduced megaspores, microsporogenesis being normal. Agronomically useful inbreds were outcrossed to *elel* stocks and the F_1s back crossed to the former parents. Back-cross progenies were selfed and the segregates crossed with established autotetraploid males. The *elel* segregates produced $3x$ and $4x$ zygotes whereas the ± segregates gave rise only to $3x$ zygotes. The autotetraploids thus obtained were allowed to interpollinate. Conversion of open-pollinated $2x$ varieties to the $4x$ condition, using isolated crossing-block techniques, is under way. The fundamental objective of the project is transformation of a $2x$ species, with all its genetic diversity, into a $4x$ species.

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

928 *Alikhanian* [*Alihanjan*] *S. I. & Iljina, T. S. Mutagenic effect of actinophage.* (*p. 4*).

As already reported, colony-type and biochemical mutants have been induced in *Actinomyces* (*Streptomyces*) *olivaceus* by actinophage treatment [XXVIII, 3705]. Actinophages may differ in their mutation spectrum. The host may also affect the mutation spectrum. For example, a particular actinophage grown on *S. griseus* 'II' induced white, light-yellow and lemon-yellow mutants whereas when grown on *S. olivaceus* 'N–6' the same phage induced black and brown mutants. Such an influence of the host upon the mutagenic properties of the phage gives grounds for comparing the phenomenon with transduction in bacteria.

929 *Alikhanian* [*Alihanjan*], *S. I. & Iljina, T. S. Recombinations in* Actinomyces rimosus. (*pp. 4–5*).

Prototrophic colonies were obtained from mixtures of biochemical mutants belonging to the same or different strains of *A.* (*Streptomyces*) *rimosus* [cf. XXVIII, 1128]. Frequency of recombination within a given combination depended on the conditions of mixed growth. Conditions (unspecified) resulting in an increase of the frequency of recombination up to a thousand-fold were found. No recombinants appeared at all in a liquid medium, either in shaken flasks or under stationary conditions. Two to three types of prototrophs, differing morphologically and in antibiotic activity, were discovered within some combinations. The proportions of the distinct types appearing in any one combination varied according to the conditions under which the parents were grown. In antibiotic activity, the recombinants surpassed their immediate parents, in some cases being equal or somewhat better than the original strains from which the mutants were isolated. Some recombinants were completely stable while others produced some auxotrophic segregates which were identical biochemically with one of the parents. Segregates corresponding to the other parents were not discovered.

930 *Armstrong, J. M. & Hattersley-Smith, M. Polyspory in an amphidiploid of* Triticum-Agropyron *hybrids.* (*p. 8*).

A gene inciting spindle abnormality was found in an F_9 amphidiploid line of *T. turgidum* x *Agropyron intermedium*. Over 50% of the microsporocytes contained five to eight microspores instead of the normal four. The occurrence of microspores with two nuclei was also common, particularly in tetrads. Meiosis was regular up to metaphase II, at which stage a secondary spindle was formed. The number of chromosomes on secondary spindles ranged from three to one-half of the complement of 32–35. After telophase II, wall formation was usually initiated. Plants carrying the gene were almost completely sterile.

931 *Bailey, C. H. & Hough, L. F. Inheritance of season of ripening in certain peach progenies.* (*p. 10*).

Inheritance of season of ripening was studied in crosses between (1) Jerseyland and five early-ripening varieties or selections, including Prairie Daybreak, and (2) Prairie Daybreak and another early-ripening selection (7039). The presence of genes at six loci acting cumulatively to shorten the time required for ripening was detected. Specific modifiers are postulated for five loci. When in the dominant condition, genes at three of the loci shortened the period of ripening by 2 or more weeks. When in the recessive condition, another locus shortened the period by two weeks. Most of the variation in ripening season among the progenies could be interpreted on the basis of dominance, epistasis, duplicate factors and modifiers. Jerseyland and Prairie Daybreak, the latest parents, were homozygous with respect to five loci and heterozygous at the locus shortening the period of ripening by 2 weeks when recessive. Different modifiers were present in the two varieties. All of the earlier-ripening varieties in crosses (1) contained the dominant gene B_2 plus modifiers. Four were homozygous for the same five genes present in the homozygous condition in Jerseyland and Prairie Daybreak. Selection 7039 carried a dominant gene (D), four pairs of genes common to the other six parents and one other gene. Cross (1) was the only combination giving rise to seedlings ripening earlier than Mayflower.

932 *Bajer, A. & Bajer-Molé, J. Mitosis in living cells—a film: normal, β-irradiated and colchicine mitosis.* (*pp. 10–11*).

The endosperm of many species is particularly suitable for studies of mitosis. The length of individual chromosomes in endosperm nuclei decreases throughout mitosis and the volume increases until metaphase, decreasing during anaphase. The first sign of the spindle is the clear structureless zone appearing round the nucleus; the nuclear membrane breaks when the zone reaches its maximum dimensions. The clear zone is the cytoplasmic constituent of the spindle, its formation probably being initiated by substances passing from the nucleus. The moment of dissolution of the nuclear membrane may be exactly estimated, since it is followed by the sudden aggregation of the central mass, i.e. the contraction stage. After this stage cooperation between centromeres and spindle takes place; its moment of commencement may be seen as centromere stretching in some cells. During prometaphase the centromeres do not always move towards the equator by the shortest route but may move towards the pole and return. Acentric fragments are eliminated at the poles. Some chromosome arms may undergo abrupt bending movements which are absent in c-mitosis. During anaphase, the changes inside the stem body cause the whole half-spindles to move apart. In anaphase-telophase, during the formation of the phragmoplast, all particles and chromosome fragments are eliminated at the poles and the whole nuclei are pushed apart, giving the impression of a second anaphase at early telophase.

933 *Baker, H. G. Observations on heterostyly in some species of tropical plants.* (*p. 11*).

Observations on the evolutionary significance of heterostyly include the following. In the tribe Psychotrieae of the Rubiaceae, West African species of *Psychotria* and *Uragoga* are heterostylous and largely self incompatible. In *P. warneckei*, however, "cross-over" long-styled plants which are self compatible have been established, in addition to normally heterostylous plants. This trend towards secondary monomorphism may be associated with the relatively unattractive flowers of this species and its weed behaviour. In the tribe Mussaendeae of the same family, at least two species of *Mussaenda* are heterostylous without the usual differences in pollen size between long and short-styled plants, whereas other species are functionally diecious. The probable derivation of diecism from heterostyly in this genus does not necessarily support the Darwinian view that heterostyly is usually a stage in the transition from hermaphorditism to diecism. It may owe its origin to the difficulty in transference of the pollen from deep-seated anthers to short styles in species with congested corolla tubes. In the Oxalidaceae, the trimorphic outbreeding system has been studied in *Oxalis*, *Biophytum* and *Averrhoa*. Because of the greater complexity of this system compared with the dimorphic, the number of ways in which it can break down to provide monomorphic, self-compatible populations is correspondingly greater. Attention is drawn to "the correlation between monomorphism and weediness on the one hand, and establishment after apparently long-distance dispersal, on the other," in *Oxalis* and *Biophytum*.

934 *Bakhteyev, F. Kh.* [*Bahteev, F. H.*] *& Darevskaya* [*Darevskaja*], *E. M. Spontaneous and artificial hybridization in the genus* Hordeum *L.* (*pp. 12–13*).

With reference to work in the USSR, the authors discuss interspecific and intergeneric hybridization of *Hordeum*.

935 *Barber, H. N. The processes of natural selection.* (*pp. 13–14*).

An analysis has been made of the above in populations of rabbit, *Eucalyptus* and white man in Tasmania. In *Eucalyptus*, changes in the frequency of genes for flavonoid production in young leaves in coppice and saplings have been determined. Preliminary estimates indicate about a 5% increase in the fitness of genes for red flavonoid as compared with those for yellow green, when the forest canopy is removed. From untouched forest, evidence of a cyclical change in fitness has been obtained, the fitness of genes for red gradually decreasing as the canopy matures. This cycle of selection maintains a true morphic balance over wide areas. Comparison of frequencies of waxy *vs.* glaucous plants in adult forest with those in seedlings derived from mother trees along steep altitudinal clines has offered evidence that in *E. urnigera* genes for wax production are effectively lethal at the lower limit of 2000 ft., whereas above this altitude such genes are essential for survival. In all the organisms investigated, "fitnesses change rapidly and greatly in both space and time. The evolutionary implications of such systems of selection will be discussed, in relation to sampling 'drift,' the origin of correlated variation (often interpreted as 'introgression') and the possibilities of sympatric speciation."

936 *Beatty, A. V. & Beatty, J. W. Cellular mechanisms involved in radiation-induced chromosomal aberrations.* (*p. 16*).

In investigations on the above at Emory University, Ga., use is being made of the first microspore division of *Tradescantia paludosa*, X rays (usually a total dose of 400 r.) and experimental variables which include the use of oxygen at various concentrations, carbon monoxide, sodium iodoacetate, p-chloromercuribenzoate and temperatures ranging fom 0° to 45° C. It has been found, for instance, that 400 r. of X rays, administered at any intensity in the presence of 5% oxygen, results in about 0·90 aberrations per cell when the energy-supplying system is inhibited by carbon monoxide, low temperatures or both. In an oxygen-free atmosphere a maximum of 0·65 aberrations per cell has been obtained, following an anoxic condition extended to 400 min. Immediate radiation after the material is placed in an oxygen-free atmosphere leads only to 0·24 aberrations per cell. Although sodium iodoacetate (M/1000) and p-chloromercuribenzoate (M/10,000), when used as anaerobic inhibitors, increase the production of aberrations about a hundredfold over the controls, the frequency does not equal that obtained by subjecting the material to 400 min. of anoxia.

937 *Berg, R. L. The general evolutionary principle underlying the origin of biological homeostasis.* (*pp. 23–24*).

"An investigation was undertaken to establish the diversity of the degree of stability of various characters of species, to find out the adaptive significance of this diversity, and to reveal the mechanism leading to the origin of higher degrees of stability.

"Dimensions of different parts of 20 species and varieties of angiosperms have been studied. The degree of stability is expressed by the ratio V max/V min and by the variation coefficient; the degree of independence by the correlation coefficient. The absence of correlation indicates the independence of dimensions of the organ in question from the dimensions of other parts of the organism.

"Comparison of the vegetative and reproductive characteristics shows the higher stability of the latter in all the species and varieties studied. High correlation coefficients have been detected for the dimensions of stems, leaves and inflorescences. The especially high degree of stability as well as the absence of correlation has been detected for the corolla and for stamens of plants pollinated by specialized insects. In self-pollinated plants as well as in plants pollinated by unspecialized insects or inanimate agents, a relatively low degree of stability of reproductive characteristics and no independence of their dimensions are observed. Stability and independence are thus inherent in dimensions of those parts of dorsoventral laterally placed flowers which participate in the process (described by Darwin, and recently by Schwanvitsch) of precise localization of pollen on a definite part of the body of the specialized insect. Specific pollinating insects act as selective agencies with respect to dimensions of certain parts of flowers. They take no part whatever in the formation of flowers during ontogeny. In higher organisms formative and selective factors never coincide. The lack of coincidence between formative and selective factors is the general principle underlying the origin of homeostasis. In the process of evolution this principle came into action simultaneously with the origin of the alternation of generations, and acquired special importance after the origination of ontogeny. Coding inherent in the physical basis of heredity is its direct consequence."

938 *Bianchi, A. Genetic and cytological studies in Italian maize varieties.* (*pp. 25–26*).

In selfing carried out to detect mutants, segregation ratios have often been close to 3 : 1, with the exception of plant-colour characters. In a few cases the ratio was 15 : 1. In a total of 290 selfed plants belonging to 170 different samples of open-pollinated populations, the following mutants have been observed, the figures in brackets referring to the number of different types discovered: defective seed (12); sugary endosperm (1); virescent (24); glossy (20); albino (18); *luteus* (12); yellow green (11); yellow stripe (6); abnormal growth (6); pale green (5); liguleless (4); fine stripe (3); brownish midrib (2); irregular (necrotic?) glossy (2); and pigmy (1). Out of 12 mutants with defective seed, only one was derived from material from northern Italy, although this region contributed about two-thirds of the samples. Several "weak alleles of the tunicate type" have been identified, especially in samples from central and southern Italy. Cytological analysis has dealt mainly with knob number and situation. Average number of knobs is low, never exceeding 4. Identification of the knobs was possible in most cases. Knobs were most frequently found on the long arms of chromosomes 7 and 8 and on the terminal portion of the short arm of 9. A well-defined chromomere may be observed following the knob in the long arm of 8, closer to the knob than in American strains. B chromosomes have been found in only one plant. Pachytene chromosomes occasionally underwent incomplete synapsis or precocious desynapsis. In two plants, metaphase I showed four bivalents and several univalents. Chromosome spreading at pachytene, as well as the staining was quite variable; the very clumped type of pachytene configuration has however not yet been found.

939 *Bishop, C. J. Radiation-induced morphological changes and fruit color mutations in the Cortland apple.* (*p. 26*).

Work on the induction of somatic mutations by X and thermal-neutron irradiation at the Kentville Experimental Farm, Nova Scotia, is described [cf. XXVII, 3385 and 4310].

940 *Blickenstaff, J. P. S. & Nilan, R. A. Pachytene chromosome analysis in barley.* (*pp. 26–27*).

Microsporocytes of fertile lines derived from certain heterozygotes of the strain carrying the short (sc) chromosome have proved favourable for pachytene analysis [cf. XXV, 1978]. The mutant character sc is associated with extremely condensed diacinesis, pollen sterility and well spread chromosomes at pachytene. Selected fertile lines appear to be normal at diacinesis but their chromosomes at pachytene retain the well-spread condition. "The problems of chromosome spreading and staining have been alleviated by examining freshly fixed (4 parts alcohol : 1 part acetic acid) microsporocytes that were subsequently stained in acetocarmine and smeared following steaming." Except for the two satellited chromosomes, no major features distinguishing individual chromosomes were observed. Relative lengths and arm ratios are being used as the chief means of identifying the nonsatellited chromosomes. Pachytene measurements have been compared with those obtained from somatic chromosomes in the same plants. Chromomere size, number and pattern, as well as tertiary constrictions, are also being used as means of identifying the chromosomes. In order to assign each linkage group to a specific chromosome, translocation-tester stocks have been crossed with the selected lines.

941 *Borojević, S. The occurrence on wheat of branched ears in the crosses of species with unbranched ears.* (*p. 30*).

In crosses of two common wheat varieties with *Triticum dicoccum*, studied at the Faculty of Agriculture, Novi Sad, Yugoslavia, some segregates with branched ears appeared in the F_4 and F_5, although none of the parents had this character. In succeeding generations, plants with branched ears gave rise predominantly to segregates with branched ears, the segregation ratio for branched *v.* simple ears being quite irregular. Branching was of the *T. turgidum* or *T. vavilovii* type. All plants with branched ears had $n = 14$. The majority were regular in meiosis, only a few containing univalents, which disappeared in latter generations. The plants were highly sterile, particularly in the lateral ears, and had a longer growing season than their parents. The central ear often developed earlier than the lateral ears. The intensity of branching varied from year to year. The occurrence of branched ears is attributed to an interspecific interaction whose expression was determined by the environment. Short days and lower temperatures are considered to be the chief factors upon which the expression and stability of the character depended.

942 *Breslavets [Breslavec], L. P. Significance of plastids for inheritance in connection with the problem of their origin.* (*pp. 32–33*).

The author presents the following evidence in support of the hypothesis that the plastids of most angiosperms have lost their ability to divide. (1) Experiments in which the development of each single plastid in different cells of a leaf was studied in the intact living plant failed to reveal division. (2) The slowness of the division of plastids in some angiosperms which have retained this ability is not in correspondence with the rapid growth of the leaves in angiosperms. (3) Plastids may develop through the transformation of mitochondria, which arise "from the microsomes by means of the decomposition of complex organic molecules to smaller and simpler ones." (4) As shown by investigations on petals of *Tropaeolum majus*, inheritance of plastid characters in angiosperms depends upon nuclear components.

943 *Brewbaker, J. L., Shapiro, N. & Majumder, S. The incompatibility inhibition in flowering plants.* (*p. 33*).

As in a previous paper by the first author [XXVIII, 2527], two principal ways in which pollen inhibition may be effected were recognized: (1) inhibition of germination, associated with trinucleate pollen grains, and (2) inhibition of tube growth, common among species with binucleate pollen. A possible third group comprises species with binucleate pollen and hollow styles in which gametic fusion is prevented. *In vitro* studies are in progress, chiefly using *S*-allele homozygotes, with the aim of isolating allele-specific inhibitors and minimizing the effect of nonspecific inhibitors such as suboptimum or superoptimum amounts of sugar and borate or excessive concentrations of salts. The first type of inhibition in, for example, broccoli and *Crepis*, has not been effected *in vitro*. Trinucleate grains appear in general to have very considerable requirements for sugar and oxygen in order to germinate. Incompatibility is related to osmotic conditions and germination may often be induced by macerating the stigmas or otherwise altering the milieu of the stigmatic surface. Results have been obtained suggesting that the second type of inibition may be demonstrated for each of the seven alleles under test in *Petunia.* Significant differences in growth have been observed between pollen from incompatible and compatible genotypes, when grown in extracts of styles in sugar-borate solutions. It has been possible to disrupt synthesis of specific inhibitors in the style by X irradiation. Such disruption may be a possible cause of so-called revertible mutations of *S* alleles.

944 *Brink, R. A. The genetic basis of a transallelic change occurring invariably in certain maize heterozygotes. (pp. 34–35).*

"The R^r gene in maize which is ordinarily a stable factor conditioning self-colored aleurone, is changed invariably to a weakly pigmented form ($R^{r:st}$) in heterozygotes with stippled (R^rR^{st}). Stippled is an aleurone spotting factor, and shows no evidence of alteration in the process whereby standard R^r is changed to $R^{r:st}$ in R^rR^{st} heterozygotes. Germinally transmissible mutations of stippled to self-colored aleurone occur in this stock at the rate of about 2 x 10^{-3}. Ten such independently occurring self-colored mutations were tested in heterozygotes with standard R^r for ability to change standard R^r. Nine of the mutants invariably induced the change from standard R^r to $R^{r:st}$; the remaining self-colored mutant exerted no effect on standard R^r in heterozygotes. These findings exclude the R^{st} allele, as such, and self-colored mutations from stippled, as such, as the promoters of the transallelic change in standard R^r. The active element may be (1) a unique component of the R^{st} allele, or (2) the 'stippling component' itself, assuming R^{st} is a compound allele comprising an anthocyanin factor and a second element, the stippling component, which determines spotting. On the second hypothesis it is necessary to assume also that (*a*) the two elements are separable by transposition, or otherwise, and (*b*) the action of the stippling component varies according to chromosome position. It could be supposed, for example, that the stippling component conjoined with the basic color factor leads to aleurone spotting, whereas even slight displacement of the former results in self-color. Similarly, the transallelic effect of the stippling component on standard R^r may occur only when the stippling component is present at, or very close to, the *R* locus in the homologous chromosome." [Cf. XXVII, 1739 and 4004, and XXVIII, 4151].

945 *Britton, D. M. Chromosome studies in* Rubus. *(p. 35).*

Attention is drawn to (1) difficulties affecting the reliability of chromosome counts in *Rubus* [cf. XXVIII, 4682], (2) the readiness with which even wide crosses may be effected within the genus, (3) the occurrence of dwarfs and sterile plants in the progeny of controlled crosses, (4) and the importance of mitotic instability as a cause of phenotypic variability [cf. XXVII, 4431]. The causes of the unfruitfulness referred to under (3) have not yet been elucidated. Aneuploidy is not considered to play a role in the origin of the dwarfs.

946 *Brooks, J. S. An experimental re-examination of mass selection in corn,* Zea mays *L. (pp. 35–36).*

In an experiment initiated at the Oklahoma Agricultural Experiment Station in 1950, selection was simultaneously practised to achieve (1) a reduction in plant and ear height, (2) maintenance of the average number of nodes above and below the ear, (3) increased individual-plant yield (4) increased ear length and (5) an increase in the average number of rows of grain per ear to 16–18. Such selection was applied to four open-pollinated varieties for 5 years, using about 400 plants of each variety each year and choosing the ears from 20 plants for producing the next generation. Each variety was allowed to undergo open pollination in isolation, individual-plant records being made for all the characters. Similar measurements were recorded on F_1 plants of a cross between two inbreds and used as an indication of environmental and seasonal variation. Selection for (1) resulted in greater reduction in height than would be expected from the separate selection differentials. Node numbers remained essentially constant during the reduction in height. The response to selection for (5) differed according to the variety. Selection for (4) apparently had little effect while selection for (3) seemed to lead to a decline in yield. This decline in yield in spite of a strong positive selection differential is interpreted as being the result of inbreeding depression. Evidence that inbreeding had occurred was obtained by shifting to a pedigree form of progeny selection.

947 *Brooks, M. H. A comparative study of the patterns of development in certain facultative apomicts. (p. 36).*

Embryological investigations were carried out on *Dichanthium* and *Bothriochloa.* Diploid

Dichanthium (species not given), which reproduces sexually, contained only one embryo sac per ovule, all the sacs being of the same type with 2 synergids, 1 egg, 2 polar nuclei and a group of antipodals. Polyploid accessions of the two genera were facultative apomicts in varying degrees, with multiple sacs which were of two types. One type of sac was similar to that found in 2*x* *Dichanthium* while the other was 4-nucleate, lacking one polar nucleus and antipodals. The average numbers of sacs per ovule and frequencies of the 2-polar type of sac in polyploids were respectively as follows: 4*x* *Dichanthium*, 1·7 and 28%; 6*x* *Dichanthium*, 1·2 and 15%; 4*x* *Bothriochloa*, 1·7 and 12%; and 6*x* *Bothriochloa*, 2·0 and 9·7%. The development of ♂ and ♀ gametes was better synchronized in *Dichanthium* than in *Bothriochloa*, particularly in 2*x* *Bothriochloa*. Breeding behaviour and several other embryological observations suggested that *Bothriochloa* tends more strongly towards obligate apomixis than *Dichanthium*, apomixis in the former genus presumably being of more ancient origin.

948 *Brown, M. S. The implications of pachytene and metaphase pairing for species differentiation.* (*pp. 36–37*).

"The genus *Gossypium* includes eighteen diploid species which fall into five genome groups on the basis of metaphase chromosome association and geographical distribution. Within a genome group, species differentiation is primarily genic, and metaphase association is reduced little if any from that within a species. In hybrids between species of different genome groups, metaphase association is greatly reduced, and sterility is complete. Nevertheless, pachytene pairing is as close in sterile hybrids with reduced metaphase association as in fertile hybrids with good metaphase pairing, and as in species. Either pachytene pairing in hybrids is no measure of structural differentiation of chromosomes, or factors other than structural differences are responsible for reduction in chiasma formation and metaphase association.

"Chromosomes paired at pachytene are equal in length despite species differences in chromsome size at metaphase. Size differences are maintained autonomously in species hybrids and in aneuploids of hybrid origin. Chiasma formation likewise may be determined in each species by a mechanism analogous to that which controls chromosome size. This mechanism alone, in the absence of structural differences, may differentiate species by reducing metaphase association. Where structural differences can be demonstrated, they are not necessarily the primary factor in species differentiation."

949 *Burnham, C. R., Turcotte, E. & Yagyu, P. Interchanges involving three chromosomes in barley.* (*p. 39*).

"Among the intercrosses between the tester set of interchanges and unknowns there were two instances with a ⊙ 8. When first established, these unknowns had a ⊙ 4. In the test crosses of both parents, that with the unknown had a ⊙ 6, that with the other had a ⊙ 4. Test crosses have established one unknown as having chromosomes a, c, d interchanged.

"The F_2 progeny of one of the intercrosses with a ⊙ 8 included 20 plants with a ⊙ 8, 9 with 7II and one with a ⊙ 4. The latter is a possible crossover in a differential segment."

950 *Burton, G. W. Genetic variances in pearl millet* (Pennisetum glaucum) *and their significance to the forage breeder.* (*p. 39*).

[Cf. 175].

951 *Butler, L. Heterogeneity of recombination values in the tomato.* (*pp. 39–40*).

Conflicting reports of recombination values differing by as much as 15 ± 2% have prompted an investigation of the effect of the following on crossing over: (1) differential germination, (2) misclassification because of genic interaction, (3) genotypic background, (4) the coupling *v.* repulsion phase, (5) age of seed, (6) temperatures during the formation of the F_2 seed and (7) acidity of the soil in which the F_1 is grown. In most cases in which the recombination data were derived from more than five plantings, significant heterogeneity was shown. Most of the heterogeneity of crosses involving the genes *Xa*, *Wo*, *ro*, *rv* and *yv* could be attributed to (1). Misclassification of some combinations of *d*, *nc*, *br*, *dv*, *s*, *bk*, *tf* and *H* also accounted for some heterogeneity. Recombination values of *wt* were apparently influenced by (3). Elimination of all other factors gave no clear indication that coupling data provide different values from recombination data. Through its association with (1), (5) had some effect. The following values for different plantings of the same cross offer evidence of the influence of an environmental factor, probably temperature: 2792 plants from seed grown in the winter greenhouse, 27·7 ± 1·72%; 1755 plants from seed grown in the field, 18·1 ± 2·29%; and 1565 plants from seed grown in the summer greenhouse, 11·3 ± 2·49%. Preliminary results indicate that recombination values are higher when the F_1 is grown in acid soil.

952 *Calef, E. Integrated genetics of lambda prophage and coli K12.* (*p. 40*).

"The prophage genome is known to be attached to the genome of the bacterial host. Crosses between K12 derivatives, carrying marked lambda prophages, were carried out to find out more about the relationships of the two genomes.

"Two types of crosses were attempted; the first type making use of Hfrl and Hfr2. Among the progenies selection was made for prototroph Gal+ recombinants. Hfrl on Hfr2 in these crosses gave the same type of results. The data might be summarized as follows: The determinants of the prophage are linked to the Gal locus in the following order: St . . . h co Gal Hfrl T6. The test of linearity on these data shows apparent excess of exchange between St and h; the rate of exchange in that region ranging from 70 to 84%. This feature might be explained as the result of the recombination in incomplete zygotes. It is possible to test this explanation selecting St^r from the donor or some other marker linked to it. This new type of selection also requires the use of two pseudo-alleles Gal– and a donor Met–. The recombinants were selected to carry the following characteristics Met+ from the F—; St^r from the Hfr, Gal+ 54–2 for F— and Gal+ 32–2 from the Hfr.

"The preliminary results are promising in so far as they show no 'recombination fraction' higher than 50%.

"Owing to the peculiarity of the K12 mating system, this type of selection is somewhat inconvenient. Indeed, the conditions suitable for selection of St^r from Hfr favor reiterated mating. We are, therefore, studying a new Hfr able to transfer this particular region at high frequency and crosses in which Arginine is selected from the Hfr instead of St^r."

953 *Câmara, A., Castro, D. & Noronha-Wagner, M. Cytogenetics of accessory chromosomes in* Luzula campestris *DC.* (*p. 41*).

Reference is made to a study of the meiotic behaviour and transmission of accessories in plants with one or two of such chromosomes.

954 *Cameron, D. R. Alien substitution of a locus effecting immunity to blackshank in* Nicotiana tabacum. (*p. 41*).

In order to maintain an adequate degree of fertility, sesquidiploid hybrids between *N. tabacum* and *N. plumbaginifolia* (tbc–tbc–pbg) and back-cross derivatives were used in transferring a segment of the pbg chromosome to a commercial type. Back crossing to diploid *N. tabacum*, accompanied by selection for immunity, leads rapidly to the production of plants with $24_{II} + 1_{I}$. Such plants were 85% pollen sterile. The high frequency of ♂ transmission of the pbg chromosome indicated that the 25-chromosome grains were functioning almost exclusively. The factor responsible for pollen abortion was separated from the dominant gene *Bs* for blackshank immunity in three lines, two of which contained fragments. Plants of the other line included a fertile one with $1_{III} + 23_{II}$, the trivalent showing that an exchange between tbc and pbg chromosomes had occurred. On selfing, populations were obtained which exhibited complete immunity. Transmission percentages of about 40, 50 and 78 for ovule, pollen and selfing respectively were in fair agreement with expectation if segmental substitution had been achieved. Corresponding transmission rates in lines with $24_{II} + 1_{I}$ were about 9, 22 and 89%. Incorporation of other dominant genes from pbg has resulted in variegation in each case. Even after the 24_{II} condition was reached, segregation continued. The cause of this instability is not known. The low frequency of ♀ transmission of the chromosome carrying *Bs* in lines with 24_{II} and the "observed segregation from plants heterozygous at the *Bs* locus" suggest that isolation of a satisfactory product of introgression by this method may be more difficult than expected.

955 *Cameron, J. W. & Cole, D. Use of the genes* su$_2$ *and* du *to reduce starchiness during ontogeny in the maize kernel.* (*pp. 41–42*).

The recessive gene su_1 results in more sugar, less starch and considerably more water-soluble polysaccharide (WSP) than Su_1. The genes bt_1 and bt_2 also reduce starch content and increase the amount of sugar but do not cause an accumulation of WSP [cf. XXVII, 1419]. The separate effects of su_2 and *du* have been determined in several inbreds also homozygous for su_1. The most consistent effect of su_2 or *du* was to lessen the starch accumulation, this effect often being detected 16 days after pollination or earlier. Starch content was 25–50% lower in homozygotes for su_1 su_2 and su_1 *du* than for su_1 in six genetic backgrounds at 16–22 days after pollination. Within inbreds, absolute differences in starch were relatively independent of dry weight per kernel. The three genotypes did not differ consistently in sugar and WSP contents, but increased tenderness and a less starchy taste were characteristic, especially in

su_1 su_2. Other changes in carbohydrate characteristics, such as amylose-amylopectin ratio or the nature of the WSP fraction, may contribute to the difference in taste. Preliminary assays indicated little difference in rate of conversion of sugars and WSP during storage of kernels on the cob, but the percentage increase in starch was usually lower in su_1 su_2 and su_1 *du* than su_1. Incidence of mould on mature ears of su_1 su_2 and su_1 *du* was not significantly greater than on su_1 ears, unless ear worm had been present.

956 *Capinpin, J. M. & Chanphaka, U. Mutagenic effects of phytoextracts from* Antiaris toxicaria *(Pers.) Lesch and* Dioscorea hispida *Dennst. upon living plant tissue. (pp. 42–43).*

Treatment of root tips of *Allium cepa* with extracts from the above species induced c-mitoses.

957 *Case, M. E. Linear relationships of allelic mutants at the* pan–2 *locus in* Neurospora crassa. *(p. 45).*

As reported elsewhere [cf. XXVIII, 1374 and 3652], tetrad analysis of the cross between two mutants (B3 and B5) requiring pantothenic acid and complementing each other in heterocaryons has revealed that locus *pan–2* consists of two distinct units. The relative frequencies of the two possible cross-over categories of prototrophs from random ascospore platings of B5 x B3 establish an order of the mutants in agreement with the results from tetrad analysis, B5 being proximal to B3. Similar random ascospore platings from crosses of all the remaining 35 *pan–2* mutants indicate that noncomplementing, as well as complementing mutants, may be grouped with either B5 or B3, on the basis of both the absolute frequencies of prototrophs and their relative distributions in the cross-over categories. Additional crosses between single mutants and between single and double *pan–2* mutants provide evidence that recombination also occurs between mutants within each of the two groups and that the mutations are therefore linearly related within each group.

958 *Chase, S. S. The utilization of parthenogenesis in maize breeding. (p. 48).*

Several thousand parthenogenetically-derived haploids have been isolated in a project of the DeKalb Agricultural Association, Ill. As the result of selfing the partially fertile individuals occasionally found among haploids, several hundred homozygous diploid progenies have been developed. In tests of these as parents of the commercial type of hybrids, a high percentage have given an outstandingly good performance.

959 *Childers, W. R. A case of complete male sterility in* Medicago sativa *L. (p. 49).*

Male sterility in a plant of *M. falcata* x *M. sativa* depended upon three recessive genes, *ms3*, *ms4* and *ms5* [cf. XXIII, 414]. Microsporogenesis was regular until after tetrad formation. The developing microspores underwent rapid degeneration, which was accompanied by the appearance of extremely dense, swollen tapetal tissue.

960 *Clayberg, C. D. Genetically determined precocious centromere division in* Lycopersicon esculentum *Mill. (p. 53).*

Precocious centromere division in meiosis of a mutant of the tomato Earlypak depended upon a single recessive gene (*pc*). The division begins during anaphase I and is complete in most chromosomes by prophase II. After the separation of homologous chromosomes, some members of the complement lag and frequently divide during late anaphase. Division of the centromere appears to occur chiefly during intercinesis. At metaphase II, all undivided and divided chromosomes regularly become oriented on the plates. Both types segregate to the poles, the latter without again dividing. As a consequence of considerable lagging in meiosis II, restitution nuclei are frequently formed. The resulting $2n$ gametes may give rise to polyploids, although the mutant has extremely low pollen and ovule fertility.

961 *Coe, E. H. (Jun.). A continuing, non-reverting conversion-type phenomenon at the* B *locus in maize. (pp. 55–56).*

The alleles established as being at locus *B* are *B*, B^w and *b*, in decreasing order of dominance and decreasing depth of the colour produced. Dominance is almost complete and standard segregation ratios are obtained. In a progeny of selfed *BB* plants, two weakly-pigmented individuals resembling the B^w phenotype appeared. Self pollination of these two plants and crosses with ♀ *BB* parents failed to give strongly pigmented types. Even after three cycles of selfing and of repeated back crossing to ♀ *BB* and ♂ *BB*, no strongly pigmented plants were obtained. The exceptional weakly pigmented type is ascribed to the action of B'. Crosses of B' x *bb* give weakly pigmented plants and on selfing segregate in the ratio of 3 weak : 1 colourless. Weak pigmentation of the B' type is not due to exclusive transmission of the chromosome carrying *B′*, since normal segregation with *b* and linked markers occurs. *B′* plants continue to appear occasionally in the original *BB* line.

962 *Conger, A. D. The fate of metaphase exchanges.* (*pp. 57–58*).

In investigating radiation-induced chromosomal damage, the assumption is made that a constant proportion of exchange aberrations (dicentrics and rings) seen at metaphase give rise to bridges at anaphase. Metaphase exchanges could however fail to produce detectable bridges at anaphase either by (1) separating in a "fall free" manner, thus making no bridge, or (2) making a bridge which then breaks. In experiments on *Tradescantia*, metaphase and early-anaphase exchanges increased in frequency as the dose$^{1\cdot6}$ and were observed in almost equal numbers. Bridges at late anaphase increased as the dose^{1}. Over the dose range used, a constant proportion, about half, of all exchanges separated in a fall-free manner. Discrepancy between frequencies of metaphase exchanges and detectable anaphase bridges is therefore not caused by a changing fraction of exchanges that fall free but by bridges that break, the fraction breaking increasing with dose. An association between restituted radiation-induced breaks and breakage of anaphase bridges could explain the results. Induced breaks increase proportionately to dose; if restituted breaks are weak points in a bridge, then breakage of anaphase bridges would likewise increase proportionately to dose.

963 *Cowden, R. R. RNA distribution in chromosomes during mitosis and meiosis.* (*p. 60*).

Cytochemical investigations were undertaken to determine RNA distribution in chromosomes of onion root tips and mitotic and meiotic cells in animal organisms. The material was subjected to digestion in 0·01% DNase at 6·0 pH and 37° C. for 1 hr., prior to staining in 0·025% azure B bromide at pH 4·2 and 37° C. for 2 hr. In all cases, binding of the dye increased progressively as the chromosomes condensed. The nucleoli showed a general decrease in size and irregularity in outline as division proceeded towards metaphase. The metaphase chromosomes appeared to bind the dye in a maximum amount, with no detectable reduction at anaphase. Telophase chromosomes showed some reduction in basophilia. By the time cell division was complete, most of the chromosomal basophilia had disappeared and the nucleoli reappeared.

964 *Craig, E. M. Point mutation, its rate and biochemical effects considered in relation to senescence.* (*pp. 60–61*).

In a theoretical discussion of the above, the author suggests that the number of point mutations should always be a function of time and the rate of point mutation largely independent of the number of mitoses. This situation becomes important when considering somatic mutation and its effect on normally nonmitotic parenchyma of the adult plant. It is argued that the accumulation of somatic mutations with a deleterious effect on biosynthetic activities will gradually result in senile deterioration. Advance in biochemical complexity in evolution could not however have been made unless some mutations confer additional biosynthetic capacities and thus greater independence of the environment. Intensified study of reverse mutation should lead to the development of better reactivating methods whereby somatic cells might be induced to maintain their biosynthetic abilities and vigour in spite of aging.

965 *Crosby, J. L. The elucidation of a problem in* Primula *evolution by means of the electronic computer.* (*p. 61*).

The value of the electronic computer in the mathematical treatment of evolutionary processes is explained and reference is made to its use in elucidating the evolution of homostyly in *P. vulgaris*.

966 *Cuany, R. L., Sparrow, A. H. & Jahn, A. H. Spontaneous and radiation-induced somatic mutation rates in* Antirrhinum, Petunia, Tradescantia, *and* Lilium. (*pp. 62–63*).

In *Antirrhinum*, *Petunia*, *Tradescantia* and *Lilium*, the rate of mutation of flower-colour genes showed a linear relationship with dose rate of chronic γ rays. Average mutation rates, expressed per million cells of mature petal per unit increase in dose rate, were much greater in *Tradescantia* than in *Antirrhinum* or *Petunia*. *Lilium* showed a still higher rate of mutation, of the order of 300 spots of phenotypically different colour per r. increment of daily dose. This rate is over two hundred times that for *Antirrhinum* or *Petunia* when subjected to chronic γ irradiation. With acute X-ray treatment of *Antirrhinum* flower buds, the average rate of mutation per r. per cell was 2 x 10^{-6} above the spontaneous rate of 50 x 10^{-6}.

967 *Daly, K. An analysis of quantitative variability in* Nicotiana. (*p. 64*).

An investigation of the response of quantitative variability to selection has been initiated with a transgressive line originating from F_1 *N. langsdorffii* x *N. sanderae* 'Sutton's Scarlet' and developed by single-plant selection and selfing. The mean of the line exceeded the upper value in the larger-flowered parent for the selected character, corolla-tube length. Data were collected from selfed plants and back crosses to each parent in a single environment, an analysis of means and variance components being made for corolla-tube length and three characters for which selection was not carried out. Expectations for means and variances were developed from a model suggested by Robson [XXVIII, 1123] as an alternative to the model proposed by Hayman and Mather for genic interaction under selfing [XXVI, 813]. Three epistatic parameters for digenic interactions, additive x additive, additive x dominance and dominance x dominance, were estimated in addition to additive and dominance effects. Tests of gene effects showed all estimates to be significantly different from zero. The additive genetic effect exceeded the dominance effect for each of the four characters. The relative magnitude of dominance was less for corolla-tube length than for the unselected characters. Variance-component estimates were consistent with the results for gene effects in indicating nonallelic gene interactions. The major proportion of the increase in size of the selected line over the larger-flowered parent was attributable to additive gene action and the remainder to additive x additive interaction.

968 *Dark, S. O. S. Some interactions of* Xanthomonas malvacearum *with the B series of black-arm resistance genes in cotton.* (*p. 65*).

For many years the effects of B_2, B_3 and B_6 and of combinations of these genes in conferring resistance to *X. malvacearum* have been reported to be constant in transferences by repeated back crossing to Sudan commercial cottons. Degree of resistance of individual plants is graded on a scale 0 (immune) to 12 (fully susceptible), based on type and size of leaf spots after spraying with a suspension of the bacterium in water under standard conditions. On a *Gossypium barbadense* background, B_2 has been found by Knight to give grades 5–7, B_3 4–7, B_2B_3 3 and B_2B_6 4–5. B_2B_3 was considered to impart field resistance to the Sudan crop, although waterlogging of the plants could cause a temporary breakdown. In 1957 at Shambat, the mean grade of Sakel and Lambert cottons carrying B_2B_3 fell to 8·2, the degree of resistance being indistinguishable from that provided by B_2 alone. It is thought that a more virulent strain has evolved at Shambat despite lack of selection pressure, inoculum having always been maintained on a fully susceptible variety.

969 *Dawson, C. D. R. The origin of tingeless May King lettuce.* (*p. 66*).

May King has the disadvantage of developing a reddish-brown tinge when exposed to cold. By back crossing at the firm of A. L. Tozer Ltd., Cobham, Surrey, England, the dominant gene responsible for this defect has been replaced by its recessive allele from Tozer's Cobham Green. Two varieties, Tozer's Mayfair and Tozer's Maybelle, have been developed which possess all the desirable characteristics of May King, without tinging.

970 *DeLamater, E. D. Observations on the nature of isolated bacterial nuclei.* (*p. 67*).

Bacterial nuclei have been isolated by exposing the cells to bile salts to soften the walls and then freeing the nuclei by lysozyme treatment or differential centrifuging. Cytochemical observations revealed the presence of structures comparable to those in the intact cell, including chromosomes, spindle elements and centriole-like bodies. Electron-microscopic examination confirmed and extended the cytochemical evidence of the nature of the nuclear structures.

971 *De Serres, F. J. & Kølmark, G. Quantitative estimates of radiation-induced forward-mutation rates at the* ad–3A *and* ad–3B *loci in* Neurospora. (*pp. 68–69*).

A method has been developed which permits the direct determination of the total number of *ad–3* mutants in a given population. Its success depends upon the fact that *ad–3* mutants accumulate a purple pigment in the mycelium. Heterocaryon tests indicated that 35 of the purple mutants recovered from four different X-ray treatments involved locus *ad–3A* and the remaining 156 locus *ad–3B*. No double *ad–3A ad–3B* mutants were recovered and no evidence was obtained of the presence of other loci mutating to phenotypically identical purple mutants, either in the *ad–3* region or elsewhere in the chromosome complement. With the strain used, the maximum rates of forward mutation of 9·7 at *ad–3B* and 2·1 at *ad–3A* per 10^6 viable conidia may be expected with a dose of about 55 kr. [cf. 90].

972 *Donovan, L. S. The inheritance of leaf size in broadleaf birdsfoot trefoil,* Lotus corniculatus *L.* (*p. 71*).

Inheritance of leaf size was studied in crosses involving large-leaved var. *vulgaris* and small-leaved var. *arvensis* and found to be mainly under the control of one pair of genes, with incomplete dominance and geometric rather than arithmetic interaction. Back-cross data were indicative of autotetraploid segregation but could not be wholly interpreted on this basis. Gene interactions, at present unknown, are thought to be involved. The chromosomes of the parents paired chiefly as bivalents, quadrivalents being rare. If this species is of autotetraploid origin, as suggested by the back-cross ratios for leaf size, reversion to the diploid type of chromosome behaviour is fairly complete and disomic, tetrasomic and di-tetrasomic ratios may be expected [cf. 455].

973 *Durrant, A. Environmentally induced inherited changes in flax.* (*pp. 71–72*).

[Cf. XXVIII, 4468].

974 *Duvick, D. N. The regional localization of pollen sterility in partially sterile cytoplasmically pollen sterile maize.* (*p. 72*).

Various degrees of partial pollen sterility are expressed when certain genotypes are transferred into cytoplasms associated with ♂ sterility. Examination of the pollen from anthers over the entire expanse of individual tassels showed that in general the anther-to-anther correlation for percentage of sterile grains tends to increase with increasing proximity. For example, anthers within the same floret are more likely to have similar percentages of sterile pollen than anthers in different florets. "Islands" of sterility or fertility may be found on the tassel, showing a considerable range in extent. "This tendency for regional similarity in degree of pollen sterility will be discussed with reference to the theory that partial pollen sterility is caused by random segregation of particulate entities and also with reference to the effects of external and internal environmental factors on the expression of cytoplasmic pollen sterility."

975 *Eigsti, O. J. Chromosomes and speciation as represented in* Polygonatum. (*p. 74*).

Observations made over a period of several years indicated that the pollen tubes of 3*x* *Polygonatum* displayed considerable variation in chromosome number within single flowers. This variation is in marked contrast to the constancy exhibited by related 2*x* and 4*x* species. The degree of variation differed according to the origin of the triploids.

976 *Ellis, J. R. Intergeneric hybridisation between* Fragaria *and* Potentilla. (*p. 74*).

At the University of Manchester, England, an attempt was made to cross the cultivated octoploid strawberry as ♀ with six species of *Potentilla*. Completely sterile hybrids were obtained from the crosses with *P. palustris* ($2n = 42$) and *P. fruticosa* ($2n = 14$). In the crosses with *P. erecta* ($2n = 28$) and *P. anglica* ($2n = 56$), all the hybrid seedlings died within a few weeks after germination. *P. reptans* ($2n = 28$) and *P. sterilis* ($2n = 28$) were completely unsuccessful as ♂ parents.

977 *Emerson, S. & Emerson, M. R. Protoplasts of* Neurospora crassa. (*p. 75*).

When cultured in media containing suitable enzymes, such as commercial preparations of hemicellulase, an "osmotic" mutant of *N. crassa* produces protoplasts. These protoplasts have a structure resembling a thin cell wall but burst when the osmotic concentration of the medium is sufficiently lowered, a ruptured ghost membrane being left. The protoplasts are cenocytic, possessing as many as a hundred or more nuclei. In media containing enzymes, they increase in size and reproduce by unequal or fairly equal division, the process superficially resembling budding. In the absence of enzymes and in suitable media, the protoplasts produce a hyphal type of growth which is resistant to osmotic shock. It is suggested that the protoplasts offer useful material for certain types of genetic and biochemical studies.

978 *Endrizzi, J. E. Cytogenetic study of frego bract and a translocation in cotton.* (*p. 76*).

Heterozygous reciprocal translocations in the amphidiploid species *Gossypium hirsutum* commonly show the adjacent type of disjunction at metaphase I, progenies being recovered which are duplicate and deficient for the interchanged segments. Because of the deficiency, such plants are useful for locating genes on specific chromosomes. A duplication-deficiency type (Z692) was crossed as ♀ with a multiple-recessive marker whose genotype included the recessive gene for frego bract. About half of the F_1 had the frego phenotype. Normal F_1 plants showed regular bivalent pairing, as expected, and were therefore heterozygous for the gene for frego bract. F_1 plants with frego bract had the Z692 configuration and were thus hemizygous for the frego gene. Selfs of normal plants segregated in a 3 : 1 ratio for normal : frego. Selfs of the frego class segregated in a ratio of about 3 frego : 1 normal. Plants of the latter normal type were assumed to be the result of fusion of duplicate-deficient gametes from both the ♀ and ♂ sides. Such individuals would be homozygous deficients for the length of the interchanged segment carrying the frego locus and autotetraploid for the length of the other interchanged segment. This assumption was supported by the fact that a new type of arrangement of four chromosomes was observed at metaphase I in this normal class. Back crossing to frego should verify this assumption. "Cytological analysis of hybrids of Z692 arrangement with a D genome species and an interchange involving only A genome chromosomes showed that the interchange is between chromosomes in the A and D subgenomes and that the frego locus is in an A chromosome." The double duplicate and deficient type is fully fertile and points to the possibility that interchanges may be useful for adding and subtracting segments in the improvement of economic properties. "The fact that plants homozygous deficient for the frego locus have normal bracts is some indication of the nature of the 'duplicate homologue' in the amphidiploid."

979 *Engel, K.-H. Effect of inbreeding and crossbreeding in* Solanum tuberosum. *(p. 76).*

Reference is made to investigations in progress at the Institut für Pflanzenzüchtung, Rostock, Germany. Data obtained from the above with respect to such characters as yield, starch content, flesh colour and tuber shape are being interpreted according to an hypothesis of both dominance and superdominance.

980 *Evans, A. M. Grafting and hybridization in the genus* Trifolium. *(p. 77).*

Attention is drawn to the correspondence found between success in interspecific grafting and success in hybridization and to the consequent value of grafting as a means of screening for compatibility in interspecific matings in *Trifolium* [cf. XXV, 3135].

981 *Fejer, S. O. A gene for femaleness in hermaphrodite* Lolium perenne *L. (pp. 81–82).*

A gene for femaleness occurred in 2 out of 22 plants in the third generation of an inbred line selected as a pasture type. In all the flowers of the two plants, the three anthers were replaced by three ovary-like structures. With open pollination, a few seeds were set, which gave rise to normal and vigorous plants. Only two of these plants were sufficiently self fertile for further studies; 20 plants of each progeny were raised to maturity. Both progenies contained plants with all their flowers completely ♀, a nearly perfect 3 : 1 ratio of ☿ : ♀ segregates being found. All ♀ plants produced some seeds upon open pollination but were fully sterile when crossed with normal individuals within the same line. The normal plants in one of the lines were almost completely self fertile. It is suggested that a factor changing sex expression was segregating as a single recessive, and that the homozygous recessive ♀ plants were sterile if pollinated by a plant heterozygous for the gene. Another recessive gene, causing lethal albinism and apparently independent of that for femaleness, segregated in one of the lines.

982 *Focke, R. A new way of explaining the frequency of polyploid plants in certain habitats. (pp. 82–83).*

"From the initial consideration that the 'period of persistence' of mutated genes partly depends upon the degree of polyploidy and the mutation rate, some conclusions are drawn regarding the formation of favourable combinations of genes and the further evolution of forms caused by them. Observations and calculations are added to support the conjecture that there is a relation between the geographic distribution of the polyploids and the natural ionizing radiation occurring in those regions."

983 *Frankel, O. H., Gani, R. & Munday, A. Two independent gene systems for floral induction in wheat. (p. 86).*

As shown by crosses of speltoids with normal *Triticum vulgare*, flower development is activated by a single dominant "fertility inductor" (I^+) which is probably a part of the "supergene" inductor *Q*. A second system controlling flower development in *T. vulgare* has also been detected in the absence of I^+ and *Q*, i.e. in speltoids. Production of the most basal floret in a spikelet is conditioned by three genes, while development of the next floret requires a fourth gene and that of the third a fifth. These gene numbers are minimum assumptions. One of the genes is dominant for fertility but the remainder are without dominant effects. This polygenic system has no obvious effect on fertility in normal *T. vulgare*, although possession of four genes for sterility leads to a "trace effect of flower reduction." According to McFadden and Sears, *Q*, together with I^+, was transferred from a free-threshing Lake Dweller wheat to *T. spelta*. If this is so, the monogenic system is derived from the former and the polygenic from the latter. Whatever the origin of the two systems, the evidence suggests, however, that the polygenic system is in a degenerative state.

984 *Freese, E. Specific mutations of phage T4 induced by isoadenine. (pp. 87–88).*

The structural model of DNA, presented by Watson and Crick, suggests that the only base analogues which can be mutagenic as the result of direct incorporation into DNA are those able to form at least two hydrogen bonds with either of two normal DNA bases. A given purine analogue, for example, is expected to compete readily with one of the normal purines for incorporation in DNA. As a rare event, it may however behave in a manner similar to the normal purine and pair in its place with complementary pyrimidine. Each of such rare pairings alters the normal sequence of DNA nucleotides and causes a mutation. Such a direct mutagenic action is possible only if the base analogue can be converted by the enzyme system of the cell into the immediate DNA precursor. Applying these considerations, as well as exploiting the partially known steric requirements of the enzymes responsible for the production of DNA precursors, a small number of base analogues have been chosen and tested for their mutagenicity. It was found that 2-aminopurine (isoadenine) has a strong mutagenic effect on phage T4, many independent *r* mutants having been isolated. The results of mapping within the *r*II cistron showed that sites of high mutability exist which are different from those found among spontaneous *r* mutants. One of the sites coincides with a site of high mutability among the *r* mutants induced by bromouracil but the other sites are different [cf. XXVIII, 3708].

985 *Galinsky, I. Abnormal chromosome movement resulting from the realignment of the polar forces. (p. 93).*

Observations made on the effects of inorganic phosphate as a mitotic poison in investigations at the Biochemical Research Foundation, Newark, Del., are recorded. The material studied is unspecified. The strength of the polar forces is changed to a considerable degree, as indicated by disturbance in the distribution of the chromosomes at anaphase. A single pole may be so weak that it attracts only a few chromosomes or so strong that all the chromosomes move towards it. The movement of the poles themselves may be changed; instead of moving to the opposite parts of the cells they may remain very close together. An unusual phenomenon may be observed after breakdown of the nuclear membrane. The spindle does not appear to function and the metaphase chromosomes are not oriented on an equatorial plate. After the centromere has divided, the spindle may begin to function and the anaphase chromosomes move to the poles. The chromosomes move at different rates; some may begin their movement after the others have already reached the poles. The earlier the stage of mitosis at which the phosphate acts, the greater the disturbances in chromosome behaviour.

986 *Gerassimova-Navashina, H. [Gerasimova-Navašina, E.]. Mitotic hypothesis of double fertilization in angiosperms. (pp. 95–96).*

The author interprets the movement of the two ♂ gametes in fertilization as the result of mutual repulsion between the two sister nuclei respectively situated in the two ♀ cells ("ovule and the central cell"). The oriented nature of this repulsion is explained as follows. The two ♂ gametes are brought by the pollen tube into the region between the two ♀ cells of the embryo sac and in this region a cytoplasmic polarization exists as a consequence of the interaction between the two ♀ cells. This polarization directs the diametrically opposite movement of the ♂ gametes towards the ♀ cells. Under the influence of the resting ♀ cell, the ♂ gamete completes its mitotic cycle, entering into the resting stage. Zygotic mitosis is induced by the contents of the pollen tube, which are required to bring the ♀ cell out of its resting condition.

987 *Glavinitch [Glavinić], R. A, transformation des blés d'hiver en blés de printemps héréditaires; B, changement de l'hérédité chez le cotonnier. (A, conversion of winter wheats into hereditary spring wheats; B, alteration of heredity in cotton). (pp. 98–99).*

In an application of Lysenko's theory of phasic development at the Faculty of Forestry, Belgrade, the winter wheat Kooperatorka has been transformed into a spring wheat by altering the temperature and light conditions. Reference is also made to the early cotton variety Makedonka [Macedonian], developed from the late variety Big Boll by exposure to altered temperatures and other environmental conditions [cf. XXVII, 702].

988 *Grant, W. F. Cytological aspects of sex determination and phylogenetic trends in dioecious species of* Amaranthus. *(p. 103).*

A study was made of *A. arenicola* ($2n = 32$), *A. palmeri* ($2n = 34$), *A. tamariscinus* ($2n = 32$) and *A. tuberculatus* ($2n = 32$). No heteromorphic chromosomes which might be associated with sex determination were distinguishable nor were phylogenetic trends based on chromosome morphology discernible. Basic numbers of $x = 16$ and 17 are found in both monecious and diecious species of the genus.

989 *Griffiths, D. J., Rowlands, D. G. & Peregrine, W. T. H. Cytogenetic interrelationship of certain artificial and natural polyploid species of* Avena. (*pp. 105–06*).

Various 6*x* amphidiploids have been produced at the Welsh Plant Breeding Station, Aberystwyth, by crossing 4*x* and 2*x* species and treating the resulting triploid hybrids with colchicine. A_2 and A_3 plants of the 6*x* amphidiploid of *A. barbata* x *A. strigosa* ssp. *hirtula* were crossed with (1) natural 6*x* species and (2) other amphidiploids, data being obtained on the meiotic behaviour, seed fertility and morphological characters of the F_1 progenies. Hybrids derived from the two groups of crosses differed in chromosome pairing, fertility and the dominance relationships of mode of spikelet disarticulation, floret disjunction and degree of awning. All hybrids from (1) were almost completely self sterile whereas those from (2) gave seed sets comparable with those of their immediate parents. Bivalent formation in group (1) was markedly lower than in the amphidiploid parent, the mean values being respectively 7·8 and 14·34. Hybrids in (2) resembled their parents with respect to bivalent formation but had somewhat fewer univalents. In hybrids of the amphidiploid with *A. sativa* in (1), separation of the spikelet from the peduncle by fracture was partially dominant over the shedding type of base, but in hybrids of amphidiploid *A. barbata* x *A. strigosa* ssp. *hirtula* with other amphidiploids having the spikelet base typical of cultivated oats the shedding type was dominant over the base normally found in 2*x* and 4*x* species.

990 *Grun, P. Cytological instability of accessory chromosomes from native populations of* Allium cernuum. (*pp. 106–07*).

Telocentric fragment-sized euchromatic accessories have become established in populations in Pennsylvania and West Virginia. Variant types, including larger accessories and an isochromosome, are more locally restricted. No relationship was detected between geographical position or local ecological conditions and frequency of accessories in a population. *A. cernuum* accessories "differ from those previously described in no single character, but in the alignment of previously described types of variability. The cytogenetic resemblances and differences among known types of accessories will be discussed in relation to their evolutionary significance."

991 *Gurgel, J. T. A. The non-homologous associations of centromeres and knobs of maize chromosomes at meiosis.* (*p. 107*).

Using inbred KYS and five homozygous reciprocal translocations, it was demonstrated that the number of centromere adhesions is a function of relative length in the case of all the chromosomes except chromosome 5, which enters more frequently into centromere associations than was expected. Although the frequencies were non-significant, chromosomes 4, 7 and 8 were also involved more often and chromosomes 1, 2, 6 and 10 less often than expected. The frequencies of knob adhesions deviated widely from expectation. In the case of both centromere and knob adhesions, the presence of the nucleolus attached to chromosome 6 tended to reduce paired associations of this particular chromosome. The data obtained on centromere, knob and end associations do not support the hypothesis that heterochromatin is responsible for such associations.

992 *Györffy, B. & Kállay, I. Discrimination between genotypic and phenotypic variation of streptomycin-resistance in* Serratia marcescens. (*pp. 107–08*).

The analysis carried out by the authors at the Institute of Genetics, Budapest, is described as follows. "The indirect evidences we obtained for the genotypic variation in streptomycin-resistance are: discontinuous increase in serial transfers with small inocula, stable variants with low level of resistance, statistical demonstration of preformed clones and a good approximation to the statistical prediction of the expected distribution, and mutation rates similar to those observed in other bacteria. The range of the phenotypic expression of a genotypic expression of a genotype is broader than is assumed. Culturing or 'training' performed in complex medium impressed changes leading to a shift in the limits of the phenotypic variation without altering the genotype, thus simulating a continuous increase in resistance. But the complex medium also increases the proportion of true resistants by favoring the phenotypic expression of newly mutated cells arising in the culture. By re-tests in differential medium the limits of the phenotypic variation could be satisfactorily narrowed and the disturbing occurrence of overlap between physiological and genetic variation eliminated. This could also be proved in artificial reconstruction experiment with sensitive and phenotypically expressed resistant cells."

993 *Haas, F. L. & Doudney, C. O. Relations between nucleic acid and protein syntheses in ultraviolet-induced mutation in bacteria.* (*p. 108*).

[Cf. XXVIII, 3709].

994 *Hagemann, R. Somatic gene conversion in the tomato.* (*pp. 109–10*).

A series of multiple alleles has been found at a locus designated *sulfurea*, in investigations at the Institute for Research on Cultivated Plants, Gatersleben, Germany. Homozygotes for $sulfurea^{pura}$ alleles ($sulf^{pura\,1}$, $sulf^{pura\,2}$ and so on) have yellow cotyledons and die within 14 days if not grafted on control stocks. Grafted $sulf^{pura}$ plants produce yellow leaves. Homozygotes for *sulfurea* ^{variegata}($sulf^{vag}$) are semi-lethal. The leaves of all grafted $sulf^{vag}$ plants show a green-white variegation which is "largely due to modifications". Grafted $sulf^{pura}$ and $sulf^{vag}$ homozygotes are fertile. Heterozygous $sulf^{+}\,sulf$ plants (*sulf* denoting $sulf^{pura}$ or $sulf^{vag}$) possess green cotyledons like those of normal $sulf^{+}$ $sulf^{+}$ individuals. Upon further development, the heterozygotes give rise to branches bearing leaves with green-white variegation. The *sulf* alleles differ by the amount of such variegation they cause in heterozygotes. The progenies of normal and variegated branches were analysed. The variegation is attributed to mutation of $sulf^{+}$ to a recessive allele, the white regions being of the constitution *sulf sulf*. The $sulf^{+}$ allele is stable in homozygotes. Mutation of $sulf^{+}$ to *sulf* in heterozygotes is referred to as occurring under the influence of the *sulf* allele already present.

995 *Hair, J. B. The chromosomes of the* Podocarpaceae. (*pp. 110–11*).

[Cf. XXVIII, 4736].

996 *Harlan, J. R.* Bothriochloa intermedia *A. Camus: a study in speciation.* (*p. 112*).

Forty-one accessions of *B. intermedia* were studied for evidence of introgressive hybridization. On the basis of patterns of morphological variation, it was concluded that 16 had been derived from combinations with *Dichanthium annulatum.* Four showed evidence of being derivatives of *B. intermedia* x *B. ischaemum.* Another four were probably the result of introgression with *B. pertusa.* Three apparently had characters originating from *Capillipedium parviflorum.* The remaining 14 accessions constituted material of diverse origin which at present defies analysis. Some experimental evidence in support of these conclusions is available. The assumed *B. intermedia* x *D. annulatum* derivatives have been called the *gangetica* type of *B. intermedia.* All accessions of the *gangetica* type so far tested are facultative apomicts and hybrids have been made artificially between *gangetica* accessions and several types of *B. ischaemum, B. intermedia, B. pertusa, D. annulatum* and *C. parviflorum.* One accession of *B. intermedia* x *B. ischaemum* was also tested and found to be partly sexual. Accessions of *B. ischaemum, C. parviflorum* and *B. pertusa* so far tested have all been highly apomictic, as have most lots of *B. intermedia* other than *gangetica* types. Other species, such as *B. ewartiana,* have probably also contributed germ plasm to *B. intermedia.*

997 *Harrington, J. B. FAO regional plant breeding projects.* (*p. 113*).

Attention is drawn to the successful results of the FAO projects on (1) rice improvement, (2) hybrid maize in Europe and the Mediterranean region and (3) wheat and barley breeding in the Near East.

998 *Harte, C. Physiological genetics of leaf development.* (*pp. 114–15*).

Studies of morphology, histology and differentiation in developing and mature leaves of normal forms and leaf mutants of *Antirrhinum, Oenothera* and some tree species showed that the mutant genes exhibit a pleiotropic action affecting leaf form, cell size and differentiation of some tissues.

999 *Hartman, P. E., Hartman, Z., Serman, D. & Loper, J. C. Genetic complementarity in histidineless* Salmonella typhimurium. (*pp. 115–16*).

The mutation sites of more than 140 independently isolated histidineless derivatives were found to lie within a small chromosome region. About 80% were separable by recombination; 10% could be distinguished by their characteristic levels of negative interference, specific for each mutant. The sites have been divided into eight groups, loci *H–E–F–A–B–C–G–D*, which are "restricted to sharply defined and non-overlapping subsections of the histidine region; some appear polarized, leaky mutations occurring terminally". Among six loci, the gene order reflects the order of the biochemical steps; the *H* and *E* loci may have more complex functions in enzyme control.

"*Inter*locus tests show that genetic complementarity is generally demonstrable but is heterogeneously expressed, depending upon certain very specific mutant combinations. Particular mutations may secondarily affect reactions controlled by certain nearby loci; the presence of isoalleles is not excluded in other cases. In *intra*locus tests, negative responses have always obtained among mutants, respectively, of loci *H*, *E*, *F*, *A*, *C* and *G*. Aberrant *intra*locus complementarity occurs with high frequency in locus *B* (imidazoleglycerol dehydrase), indicating four subunits. Rare exceptional positives have been noted in locus *D* (L-histidinol dehydrogenase), especially in combinations involving *hi–10* and *–208*, located at opposite ends of the locus".

1000 *Hecht, A. Partial restoration of fertility in a sterile* Oenothera *mutant following infection by a parasitic moth larva.* (*p. 118*).

In a teratological mutant of *Oe. parodiana* with highly sterile abnormal flowers, fertile flowers appeared to be induced by infection of the ovaries with larvae of *Mompha circumscriptella.*

1001 *Highkin, H. R. Transmission of phenotypic variation in a pure line.* (*p. 120*).

In studies of heat resistance in *Pisum sativum*, "it was found that the F_1 population from a cross between two pure lines exhibited a variance in growth which exceeded considerably that of either parent. Analysis of the data showed that the excessive variance could be attributed entirely to differences among the environments of the different pollen sources."

1002 *Hirota, Y. The effect of acridine dyes on mating type in* Escherichia coli. (*p. 121*).

Genetically stable F– strains may be obtained from F+ types with an efficiency of 90–100% by growing the latter in broth containing acridine dyes. No effect upon other characters showing chromosomal segregation or upon colicin production has been observed, nor is the Hfr_1 strain W1895 affected. Some strains of intermediate compatibility have been obtained. The efficiency is influenced by the medium and by temperature. It is suggested that F is inherited as a plasmid.

1003 *Holloway, B. W. Genetic recombination in* Pseudomonas aeruginosa. (*p. 123*).

Recombination of both selected and nonselected characters has been demonstrated. A compatibility system dependent on a factor FP occurs, in which mating takes place between FP+ and FP– strains; FP– types may be converted to FP+ by contact with the latter. One interfertile strain studied has been found to be susceptible to a pyocin liberated by another interfertile strain.

1004 *Hough, L. F. & Weaver, G. M. Irradiation as an aid in fruit variety improvement.* (*p. 124*).

Mutations in season of ripening, firmness and texture of the fruit flesh and the freestone condition have been obtained in peaches grown for one or two years in the Brookhaven gamma field. In sweet cherries, dry pollen exposed to acute γ radiation had a stimulatory effect on fruit set; this effect was apparently due to induced parthenocarpy, since seed set was very low. The initial vigour of seedlings from weak seeds is much increased by thermal neutron doses at $7{\cdot}52 \times 10^6$ N/cm.^{2}/sec. for 2 hr.; this finding is expected to be useful in breeding very early peaches. It is noted that seeds show the greatest response to irradiation when they are irradiated just as germination is beginning.

1005 *Howard-Flanders, P. The effects of nitric oxide and oxygen on radiation-induced lethal injuries in bacteria and yeast.* (*p. 125*).

In studies of the survival of *Shigella flexneri* after X irradiation, the effects of nitric oxide and oxygen were similar (*a*) in the concentration of gas needed to double the X-ray sensitivity and (*b*) in the degree of enhancement of sensitivity at high gas concentrations, within the limits of experimental error.

1006 *Hunter, A. W. S. & Bragdo, M. The cytology of three hybrids between diploid and hexaploid plums* (Prunus *spp.*). (*p. 128*).

Two tetraploid plums from St. Anthony ($2n = 16$) x Mount Royal ($2n = 48$) had respectively 73% and 64% metaphase I cells with 16 bivalents. In about 80% of the cells in each tetraploid, 16 chromosomes went to each pole, but only 40% of the pollen stained with acetocarmine. A pentaploid from Shiro ($2n = 16$) x Reine Claude [Greengage] ($2n = 48$) had irregular meiosis with multivalents and univalents in all metaphase I cells; 60% of the pollen stained. Pollen size was very variable in each hybrid. Under orchard conditions, all three bear moderate crops of fruit with viable seed. In controlled crosses, the hybrids were ineffective as pollen parents for diploid or hexaploid varieties; they yielded viable seeds, however, when pollinated by hexaploid but not diploid varieties. The hybrids are expected to be useful in breeding plums which combine the high fruit quality of hexaploids with the winter hardiness of some diploid varieties.

1007 *Hunziker, J. H. Karyotype analysis in* Cupressus *and* Libocedrus. *(pp. 128–29).*
Caryotypes are described for *C. arizonica*, *C. funebris*, *C. glabra*, *C. lusitanica* vars. *lusitanica* and *benthami*, *C. macrocarpa*, *C. sempervirens*, *C. torulosa* and *L. chilensis*. Two different caryotypes were observed in *C. sempervirens* and four in *C. lusitanica*.

1008 *Hutchinson, A. H. The principles involved in polygenic selection from a polyzygous population of Douglas fir. (p. 129).*
"A genotypic evaluation of wind pollinated Douglas fir populations is premised on polygenic segregation involving various growth rates, frost sensitivity, and cyclic bud activity. In each case three or four allelic factors are required to satisfy the polyzygous states, which are evident from more than 80,000 readings. Simple equations in terms of N, the number of polygenic alleles, and n, the degree of parental heterozygosity, relate the phenotypes and genotypes of the progenitors to the class frequency distribution coefficients of the progenies $(1 + I)^n \text{ x } 2^{2N-n}$. All population curves are reduced to the common base, 2^{2N}.
"Each controlled biparental class frequency polygon of a specific polyzygous population is balanced and includes $(n + 1)$ phenotypic classes from a possible $(2N + 1)$ classes, each of which belongs to one of (factorial $(N + 1)$) effective genotypic classes. These genotypes may combine to produce factorial $2N + 1$ class frequency series, as progenies. Wind pollinated, multiparental stocks are characterized by class frequency polygons which show predictable skewness, multiple peaks and extended plateaus."

1009 *Hyde, B. B. & Paliwal, R. L. Sulfhydryls in plant chromosomes. (p. 130).*
N-ethylmaleimide applied to onion root tips for 4 or 24 hr. killed the meristem at concentrations of 10^{-3} M, completely inhibited mitosis at 10^{-4} M, reduced mitosis at 10^{-5} M and markedly decreased the frequency of SH groups in the nuclei at the two latter concentrations as determined by the Barrnett and Seligman histochemical procedure. KCN reduced SH staining when applied after fixation. A saturated solution of $HgCl_2$ results in fixation but also allows intense SH staining. A 0·05M solution of $Hg(NO_3)_2$ fixes but also either dissolves protein or suppresses SH staining, while a 0·005M solution fixes some cells but not others and appears to affect the SH group in a similar manner to other fixatives.

1010 *Hyun, S. K. Feasibility of large-scale controlled pollination as a means of mass producing hybrid pine seed. (pp. 130–31).*
From a 5-ha. stand of *Pinus rigida* in Korea, bagged and pollinated with *P. taeda* pollen from California, 2,250,000 seeds were produced, of which 58% were sound. The seedlings combined the cold resistance of the female parent with the better form and growth of the male and 80% were ready for field planting at the end of the one year compared with 20% of *P. rigida*. The cost of production was slightly less than for *P. rigida*.

1011 *Ikeda, Y. & Takahashi, T. Complementary genes controlling alpha-methyl-glucoside fermentation in Saccharomyces. (p. 131).*
In a hybrid produced between a Carbondale haploid strain (rapid fermenter) and a haploid nonfermenting strain, segregation for three alleles controlling fermentation of α-methyl-glucoside occurred. The following haploid genotypes have been recovered: nonfermenters, mg_1 mg_2 mg_3 and MG_1 mg_2 mg_3; extremely slow fermenters, mg_1 mg_2 MG_3 and MG_1 mg_2 MG_3; slow fermenter, mg_1 MG_2 mg_2; medium fermenter, MG_1 MG_2 mg_3; semirapid fermenter mg_1 MG_2 MG_3; and rapid fermenter, MG_1 MG_2 MG_3.

1012 *Iseki, S. Lysogenic conversion and transduction of genetic characters by temperate phage* iota *in* Salmonella *groups A, B, and D. (pp. 131–32).*
The production of somatic antigen 1 of *Salmonella* groups A, B and D is governed by the temperate phage ι, but in groups E, G and H and further groups which lack antigen 12 the relation between the production of antigen 1 and ι is not clear. The phage, which induces lysogenic conversion with regard to somatic antigen 1 of *Salmonella*, can also transduce such genetic characters as streptomycin resistance, nutritional factor and flagellar antigen separately into the recipient strain, the transduction occurring regardless of whether the recipient is easily or hardly lysogenizable. In the former case the transduced bacteria became lysogenic, acquiring somatic antigen 1, while in the latter case, even after transduction of characters, they generally remain sensitive without somatic antigen 1. The transduction of characters is induced by ι phage sometimes also into recipient strains which possess somatic antigen 1, but at much lower frequencies.

1013 *James, A. P. The frequency distribution of radiation-induced mutants affecting a quantitative character in yeast. (pp. 133–34).*

The X-ray induced mutation spectrum for growth rate was studied in an inbred yeast strain by observing the growth rates of the microcolonies from the individual ascospores. An exposure of 30,000 r. produced recessive lethals and near-lethals of all types in one quarter of the survivors. The ratio of these severe effects to less severe reductions was approximately 1 : 1. The distribution of the different degrees of these nonlethal and near-lethal effects appears to be bimodal.

1014 *Jenkins, B. C. & Evans, L. E. Some alien chromosome additions to common wheat. (p. 134).*

The procedure used at the University of Manitoba in adding whole chromosomes of (*a*) the winter rye Dakold to the winter-hardy wheat Kharkov MC22 and (*b*) *Agropyron elongatum* from the 56-chromosome derivative of Chinese Spring x (Chinese Spring x *A. elongatum*) F_{15} to the wheat Chinese Spring is outlined. In both cases the wheat parent is back crossed to the "amphidiploid" one or more times and monosomic and disomic addition lines are selected cytologically in subsequent generations. In the 43 and 44 chromosome plants obtained in this way the extra chromosomes are identified first by any gross morphological changes associated with their presence and secondly by studies of the behaviour of the extra chromosome in the F_1 of diallel crosses.

1015 *Jenkins, J. A. & Berg, B. O. Inheritance of fruit size and shape in the tomato. (pp. 134–35).*

Inheritance of fruit shape and size was studied in the F_1, F_2, F_3 and back-cross generations of a cross between two tomatoes referred to as Lindstrom's *d–p–o–s* (dwarf, peach fruit, oval fruit, compound inflorescence—linkage group I) and MacArthur's *f–a–j–lf* (fasciated fruit, green stem, jointless pedicel, leafy inflorescence—linkage group V). On a logarithmic scale, segregation at the major loci *o* and *f* contributed 30% and 50% of the total additive genetic variance. The remainder was attributed to modifying genes. The major loci showed no interaction. Each exhibited partial dominance but in different directions. The method of Comstock and Robinson for estimating average dominance [cf. XXIII, p. 673] gave a more satisfactory agreement with the data than the method of Fisher and others. The four homozygous genotypes *OOFF*, *OOff*, *ooFF* and *ooff* have been isolated in a relatively uniform background. "When all four tester lines are crossed with a new variety, the locule number of the F_1 hybrids may be used to determine what alleles the new variety has at the *o* and *f* loci and if it has alleles at other major loci determining variability in locule number."

1016 *Johnson, L. P. V. & Aksel, R. Inheritance of yielding capacity in barley. (p. 136).*

Fifteen varieties were crossed unidirectionally in all combinations; 105 crosses were obtained. Yields of F_1 and corresponding F_2 populations gave highly significant correlation coefficients of + 0·4815 for 36 crosses consisting of a 9-parent diallel and +0·2735 for the 105 crosses. Genetic analysis of the 36 crosses and nine parents showed that dominance was present but not unidirectional and revealed significant asymmetry at loci exhibiting dominance. "Although the heterogeneity of *Wr–Vr* was not significant (error value was rather high), analysis of the (*Vr,Wr*) graph suggests possible non-allelic interactions; genotypic-environmental interaction is probably also present." The data indicate overdominance. The F_2 data give similar results on analysis and also show overdominance.

1017 *Jugenheimer, R. W. Performance, uniformity, and practicability of various types of corn hybrids. (pp. 137–38).*

[Cf. XXVIII, 1324].

1018 *Käfer, E. Analysis of a translocation by means of mitotic recombination in* Aspergillus nidulans. *(pp. 138–39).*

Ultraviolet irradiation of a standard biotinless strain *bi* gave rise to a cholineless mutant *cho*. The new strain *cho bi* carried a chromosomal aberration involving linkage groups I and VII and when the new strain and its meiotic recombinants with markers on these linkage groups were tested by means of mitotic haploidization, the data indicated that a translocation between the two chromosomes is present which can be separated from *cho* by meiotic crossing-over. The translocated piece showed very close linkage, with 4% crossing over, to the most distal marker on the left arm of linkage group I and it was confirmed that a substantial chromosome piece of linkage group VII is attached in this position.

1019 *Kamra, O. P. & Nilan, R. A. Anatomy of the multiovary mutant in barley. (pp. 139–40).*

In the multiovary mutant *mo* [cf. XXIV, 2005], transformation of the stamens into pistils appears to take place very early in development. Florets of the median spikelets have one lodicule, those of the lateral spikelets two. The embryo sac appears to be normal, and the ovule may be naked or enclosed. The variability of these characters suggests that *mo* has a low expressivity.

1020 *Kaudewitz, F. A new type of mutation-delay in bacteria.* (*pp. 142–43*).

Mutants showing prototrophic reversion, obtained by UV-irradiation of the *Salmonella typhimurium* auxotrophic strain lys–1, exhibit a marked delay in commencing to multiply. Experimental evidence indicates that this cannot be due to (*a*) a prolonged lag phase of the mutants, (*b*) segregation of several nuclei per cell or homologous genetic subunits, only one of which is mutated, or (*c*) the formation of filaments. It is suggested that the delay results from the linear transfer of the character "potentially mutated." Genetic manifestation of the character was highly sensitive to temperature and showed low transducibility. These features, as well as the delay in increase, were displayed also by spontaneous reversions of lys–1 and in other reversions from auxotrophic mutants of *S. typhimurium* and *Escherichia coli*. The following hypothesis accounts for the observed facts. "By the mutational event part of the genetic material is separated from the linkage group. Having lost its reproducibility it is transferred for some time linearly. Its reincorporation may lead to a variety of rearrangements which, as nongenic suppressors, cause quantitatively different prototrophic characters." Most of these rearrangements are too large to be transducible.

1021 *Khitrinsky, V.* [*Hitrinskij, V. F.*]. *Controlled heredity changes aimed at transforming spring varieties into winter crops seen as a plant-breeding method.* (*pp. 143–44*).

At Odessa, genetically homogeneous varieties of spring wheat, sown in November and December in the first experimental year and in September in succeeding generations, underwent morphological and physiological changes which proved to be both heritable and stable. The changes included the development of the creeping stem characteristic of winter varieties, increases in dry matter content, sugar percentage and water retaining capacity and lengthening of the vernalization period. Quality and quantity of light affected the development of frost-hardy rye and wheat strains with winter characteristics, supplementary night lighting with incandescent lamps being most favourable [cf. XXVIII, 4005]. Modified strains of the wheat Odessa 13 showed a change in the period required for ear development, and showed high grain, flour and bread quality, but were generally below the standards in yield.

1022 *Kihara, H., Yamashita, K. & Tanaka, M. Some aspects of the genomes of 6x species in* Aegilops. (*p. 145*).

An earlier account of this work has already been summarized [XXVIII, 4116].

1023 *Knight, R. L., Keep, E. & Briggs, J. B. Resistance in the red raspberry to* Amphorophora rubi (*Kalt.*). (*p. 147*).

An account of this work has been summarized from another source [XXVIII, 4594].

1024 *Knight, R. J.* (*Jun.*). *The adaptive significance of variation in response to dark period in* Ipomoea. (*pp. 147–48*).

Among four species of *Ipomoea* and one artificial amphidiploid, collected from different northern latitudes and grown under natural day lengths at 39° N. in Virginia, those from the northernmost regions began to flower earlier than the southern types during the short days of winter and spring or the shortening days of summer. With decreasing latitude of origin, there was a declining sensitivity towards lengthening nights, as shown by a tendency to remain longer in the vegetative stage. Hybrids between short-day and long-day forms in two of the species showed dominance of the short-day character. A small F_2 population segregated for flowering behaviour when grown under ten-hour dark periods.

1025 *Knott, D. R. The effect on wheat of an* Agropyron *chromosome carrying rust resistance.* (*p. 148*).

The production of rust-resistant substitution lines, in which a pair of *Agropyron elongatum* chromosomes replace a wheat pair, and addition lines in which the *Agropyron* pair is added to the total wheat complement, is described [cf. XXVIII, 2818]. Monosomic analysis revealed that two of the substitution lines lacked chromosome VI. The substitution lines showed normal vigour and fertility and some yielded as well as Thatcher, but the addition lines were later and less vigorous. Studies of plants carrying $21_{\text{II}} + 1_{\text{I}}$ *Agropyron* and $20_{\text{II}} + 1_{\text{I}}$ wheat $+ 1_{\text{I}}$ *Agropyron* indicated that the *Agropyron* chromosome has no deleterious effect upon the gametes and is equally transmitted through ovules and pollen. Gametes with 20 wheat chromosomes and one *Agropyron* chromosome appeared to have a slight competitive advantage over those with 21 wheat chromosomes.

1026 *Kobayashi, T. Radiation-induced mutant types in sesame. (pp. 148–49).*

Treatment of the Japanese sesame types B$_1$D (BAN-type), WD (3BO-type) and WD$_8$ (QAN-type) with β rays from P^{32}, X rays, γ rays from Co^{60} and β rays + X rays, resulted in three major changes, viz. alteration of phyllotaxis, development of nectary into functional flower and increase in locule number per capsule. B$_1$D (BAN-type) gave the most mutants and included types similar to those obtained from WD (3BO-type) and WD$_8$ (QAN-type), and it is suggested that the two latter forms may have originated from a form resembling the first.

1027 *Kojima, K.-I. & Cockerham, C. C. Stability of equilibrium when selecting for genes which exhibit epistasis. (p. 150).*

"A random mating population with two alleles at each locus, with free recombination between loci, and with interactions between non-allelic genes is considered. The necessary and sufficient conditions for mass selection to be ineffective and for the equilibrium to be stable are (1) over-dominance for the marginal means of each locus when at equilibrium; (2) the matrix of which the diagonal elements are the dominance comparisons and the off-diagonal elements are twice the additive x additive comparisons is negative definite when at equilibrium. When these co-ditions are satisfied, fitness is at a relative maximum."

1028 *Koo, F. K. S. Induction of somatic mutations in a balanced lethal barley stock by X-rays. (pp. 150–51).*

In plants grown from X irradiated seed lots of a balanced lethal stock heterozygous for albino (a_n) and *xantha* (x_c), the respective mutation rates per plant at doses of 0, 4000, 8000, 12,000, 16,000, 20,000 and 24,000 r. were 0, 0·080, 0·122, 0·187, 0·261, 0·272 and 0·282 for A_n to a_n and 0, 0·037, 0·061, 0·091, 0·135, 0·152 and 0·181 for X_c to x_c. For plants from normal homozygous seeds irradiated at 12,000 and 24,000 r., the respective mutation rates for albino stripes were 0·075 and 0·115 and for *xantha* stripes 0·043 and 0·058. Although some of the mutations observed in each case may involve other loci than A_n and X_c, the fact that the mutation rate is higher in the balanced lethal than in the control indicates that mutations at these two loci occurred frequently. In the balanced lethal, mutation rate at A_n was greater than at X_c and both rates increased linearly except that at higher doses the former approached a plateau. If the mutations frequently involved chromosomal losses, then these results would suggest that A_n may be distal to X_c.

1029 *Kossikov [Kosikov], K. V. The frequency of directed changes of the fermentative properties of yeasts as a function of concentration in the medium of the specific substrate and of the temperature of cultivation. (p. 151).*

An enzyme capable of fermenting a particular sugar may be induced in a yeast by growing in a medium containing the sugar, and the ability to produce the enzyme is retained when the sugar is replaced by another. The adapted character is inherited both vegetatively and sexually. In studies of the adaptation of *Saccharomyces globosus* to the fermentation of sucrose, these observations were confirmed and a correlation was detected between the frequency of changes to the adapted form and "the number of carbon molecules dissolved in the medium and reacting with cell protoplast." An increase in temperature accelerated the process of adaptation.

1030 *Kreig, D. R. Mutation induced in bacteriophage by ultraviolet light. (pp. 151–52).*

Unirradiated *E. coli* strain B cells were multiply infected with ultraviolet-irradiated T4r phage and the progeny phage resulting from multiplicity reactivation were scored for the frequency of r^+ back mutants. Results obtained support the hypothesis that "the lower the spontaneous level of back-mutants the higher the factor of increase from radiation-induced mutation, except that genes incapable of spontaneous back-mutation also give no induced back-mutants."

1031 *Kunicki-Goldfinger, W., Lachowicz, T. & Tabaczynski, M. The role of cytoplasm in lingering modifications in bacteria. (p. 153).*

Evidence suggesting that dauermodifications may be induced by subeffective concentrations of penicillin in *Micrococcus pyogenes* var. *aureus* and by changes in temperature or composition of the cultural medium in *Escherichia coli* is briefly presented.

1032 *Kupzow, A. J. [Kupcov, A. I.]. A parallelism in variability of plant species with certain common characters. (pp. 153–54).*

It is suggested that parallelism between different families, such as Euphorbiaceae and Cactaceae, and between other taxonomic groups results firstly from nomogenically similar mutations in genotypes which are distinct in taxonomic characters but which have other elements in common, and secondly from the selective elimination of abortive genetic complexes arising through mutation.

1033 *La Cour, L. F. & Pelc, S. R. The incorporation of tritiated-thymidine in the nuclei of roots of* Vicia faba. (*pp. 156–57*).
In meristematic cells, labelled thymidine is incorporated in the DNA of the nuclei only during part of interphase. Autoradiographs of mitotic figures following growth with and without colchicine indicate that the hypothesis of chromosome duplication proposed by Taylor *et al.* [XXVII, 2508] may need some modification [cf. 120]. A proportion of resting nuclei in the zone adjacent to the root-tip meristem and later also in the zone of cell elongation gives more intense autoradiographs than do nuclei in the meristem. "Photometrical measurement of Feulgen stain in resting nuclei adjacent to the meristem has shown that a large proportion of them contain a 4C (prophase) amount of DNA. Thus the intensity of labelling in these nuclei cannot be attributed either to polyteny or to polyploidy. It is suggested that unlabelled thymidine is replaced by labelled thymidine in unlabelled strands in the chromosome at the time these cells cease to be meristematic."

1034 *Laskowski, W. & Stein, W. The effects of X-rays, UV, and other inactivating agents on the budding ability of Saccharomyces strains of different ploidy.* (*pp. 158–59*).
Haploid and diploid strains were similar in reaction to ultraviolet irradiation but differed from each other in their reactions to treatment with organic peroxides or X rays.

1035 *Lauprecht, E. & Walter, E. On the valuation of methods to form certain gene combinations by breeding.* (*pp. 159–60*).
"There are different methods of forming a certain gene combination $A_1A_1A_2A_2 \ldots A_nA_n$ by breeding when starting with types such as $A_1A_1 \ldots A_mA_ma_{m+1}a_{m+1} \ldots a_na_n$ and $a_1a_1 \ldots a_ma_mA_{m+1}A_{m+1} \ldots A_nA_n$ where the final aim can be approached slowly by alternately crossing and selecting. After each crossing the resulting combinations can be classified in states by the extent of their approach to the desired gene combination. The breeding method to be applied here can be represented by a stochastic matrix (p_{ik}) similar to the representation of a regular system of inbreeding by a generation matrix; p_{ik} is the probability for the transition from the i^{th} to the k^{th} state in a time unit. If no step in the breeding process will result in a decline, then $p_{ik} = 0$ for $k < i$. In this case the eigenvalues of the stochastic matrix are given by p_{ii}. The value of a breeding method depends on the average number of time units or the average number of individuals necessary to establish a desired gene combination.
"Another way of evaluating a breeding method is based on the number of time units necessary to establish with a given probability α the desired gene combination. When α is large it is sufficient to use the largest non-unit eigenvalue of the matrix as a measure. These methods of valuation can be applied in self-fertilised as well as in cross-fertilised populations."

1036 *Lederberg, E. M. Fine structure of the Gal loci in* Escherichia coli *K-12.* (*pp. 161–62*).
A distinctive recon (one of a group of closely linked loci separable by recombination) has been assigned to each of ten independently occurring *Gal–* mutants. Prophase-linked transduction via HFT λ resulted in heterogenotic clones when donor and recipient bore distinctive recons. The heterogenotes were unstable, segregating into the two initial and two cross-over classes. Two cistrons have been demonstrated. With members of the same cistron transheterogenotes are phenotypically mutant. "Among two hundred new mutants, no recons identical with the first ten have occurred. Most have been assigned to either of the first two cistronic groups, but a small number which would represent a fourth genetic group have given only normal galactose-positive heterogenotes with every standard *Gal–* tested. A few mutants were not transformable by λ but were found to carry other modifiers including that of hexose metabolism which obscure their relationship to the *Gal–* group."

1037 *Lee, W.-J. Physiological effect of gamma-radiation on meiosis in rye.* (*pp. 162–63*).
Irradiation of a 14-chromosome Korea rye with 150 r. from Co^{60} resulted first in the occurrence of rings, pronounced nucleic acid starvation and the presence of heterochromatic regions forming holes or hollows in most of the chromosomes. Six to twelve hours after irradiation, recovery was taking place, evidenced by stickiness and fusion, due to overcharged nucleic acid, followed by breakage.

1038 *Lerman, L. S. Estimation of the critical DNA segment required for genetic transformation.* (*p. 164*).
"The kinetics of the loss of transforming activity by pneumococcal deoxyribonucleic acid indicate

that each particle is inactivated by the introduction of a single molecular defect. Since the extent to which the inactive DNA is incorporated by competent cells is only slightly effected, it is likely that the transformation failure lies in genetic processes. Where the rate of accumulation of molecular alterations can be determined independently, the length of the active DNA segment which is vulnerable to a single attack can be calculated." These calculations indicate that the critical segment contains about 3000 nucleotides, while the length of the intact DNA molecule is of the order of 20,000 nucleotides. The lengths of the critical segments for the unlimited transformations to resistance to streptomycin, novobiocin and optochin are identical within experimental error.

1039 *Lesins, K. Progenies from a cross* Medicago dzhawakhetica *x* M. sativa. *(p. 165).*

The morphological and physiological characteristics of a hexaploid ($2n = 48$) from *M. dzhawakhetica* ($2n = 32$) x *M. sativa* ($2n = 32$) indicated that the hybrid carried four genomes of the first parent and two of the second (DDDDSS). Other progenies obtained through back crossing to tetraploid and hexaploid *M. sativa* included DDSSS, DSS$\frac{\mathrm{S}}{2}$ ($2n = 36$), DDSSSS, DSSSSS and DSSSS. The presence of articulate pod hairs and the need for cold pretreatment for the induction of flowering, characteristic of *M. dzhawakhetica*, varied according to genomic constitution. Thus DDSSSS plants flowered freely without cold pretreatment and had rudimentary hairs, while DDSSS plants tended to flower sparsely without pretreatment and showed better development of hairs.

1040 *Leupold, U. Studies on allelism in* Schizosaccharomyces pombe. *(pp. 165–66).*

"A quantitative analysis of the meiotic formation of rare prototrophs in intragroup crosses between adenine-requiring mutants of two different groups (*ad*$_2$: 3 mutants accumulating hypoxanthine; *ad*$_7$: 11 mutants forming red pigment) has revealed a rough additiveness of the prototroph frequencies measured. This, together with the observation that any diploid clone combining two mutant genes of the same group is mutant in phenotype, suggests that these frequencies (which range from 3 to 750 prototrophs/10^6 ascospores) reflect frequencies of crossing-over recombining different mutable sites (*ad*$_2$: 3; *ad*$_7$: 9) within small chromosome sections which as a whole are acting as functional units. This interpretation may also apply to the mating type region, since crosses between heterothallic clones of opposite mating type are found to yield rare homothallic segregants (0·3%) which regularly recombine for neighbouring markers, suggesting that crossing-over between two different sites of the mating type locus is involved.

"However, efforts to demonstrate the simultaneous formation, to be expected on the crossing-over hypothesis, of two complementary recombinants per recombination event, have not been successful so far."

1041 *Levine, M. & Curtiss, R. The induction of aberrant recombination frequencies with phage P22 of* Salmonella typhimurium. *(pp. 166–67).*

Clear-plaque mutants in P22 have been classified into three distinct but closely linked cistrons, within each of which the mutants lie in linear order. Most crosses between mutants gave the following classes of recombinants in the expected frequencies: (1) a single recombinant class in which the recombination takes place between the mutant loci; (2) two double recombinant classes, the second recombination taking place to one or the other side of the clear-plaque region; and (3) a triple recombinant class, the additional recombinations occurring on either side of the clear-plaque region. In a few crosses between particular mutants one of the classes of double recombinants was larger than the single class. This extreme negative interference could also be induced in crosses in which it did not normally occur by means of either ultraviolet treatment of the phage before infection or exposure of the phage-infected bacteria to chloromycetin early in the latent period.

1042 *Li, H. W. Cytological studies of sugarcane and its relatives XV: Basic chromosome number of* Saccharum officinarum *L. (pp. 169–70).*

[Cf. 198].

1043 *Lima-de-Faria, A., Sarvella, P. & Morris, R. Structural differentiation of the chromosome in different tissues. (p. 171).*

In comparisons of (1) pachytene and (2) prophase of the second pollen mitosis in *Ornithogalum virens*, both chromosome length and number of chromomeres are smaller by one-fifth at stage (2) than at stage (1) in each of the three chromosomes, while the average distance separating the chromomeres remains about the same, being 1·07 μ for stage (1) and 0·89 μ for stage (2). The knob of chromosome II, which is very large at stage (1), is very small at stage (2) and two weakly stained segments in chromosomes I and II are not easily recognizable at stage (2). At diacinesis two deeply stained segments in chromosome I and III are visible which are not present at either (1) or (2).

1044 *Lindegren, C. C. Recombination in bacteria.* (*pp. 171–72*).

"Demonstration of Mendelian heredity requires that all the segregants of a hybrid fall into two equal contrasting classes representing the corresponding characteristics of the progenitors. Although the bacterial geneticist cannot recover all the progeny under his experimental conditions, he has assumed a 1 : 1 gametic ratio for every segregating character." The assumption that the phenotype represents the genotype implies that (1) every phenotypic change is due to gene change, (2) cytoplasmic inheritance does not occur in bacteria and (3) recombination of phenotype is equivalent to recombination of genotype. Studies of a heterozygous diploid *Saccharomyces* carrying the genes for adenine dependence and independence have shown that genes may be much more unstable in the heterozygous than in the homozygous condition, a phenomenon which produces results resembling the recovery of prototrophs. It is suggested that "the failure of the data from bacterial genetics to fit the standard meiotic apparatus may not be due to a different kind of meiotic apparatus or even due to a different kind of hereditary behaviour but may be connected with difficulties routinely encountered in all genetic analysis."

1045 *Mangelsdorf, P. C. A genetic reconstruction of the ancestor of maize.* (*p. 177*).

[Cf. 1499].

1046 *Marcou, D. Sur le déterminisme de la sénescence observée chez l'ascomycète* Podospora anserina. (*On the determinism of senescence observed in the ascomycete* P. anserina). (*p. 179*).

Reciprocal crosses and micromanipulation experiments have indicated that senescence is cytoplasmically inherited and may be transmitted either by the female parent or by means of hyphal anastomoses [cf. XXVII, 3659].

1047 *Marcovich, H. Recherches sur la mutabilité spontanée d'*Escherichia coli *B.* (*Investigations on the spontaneous mutability of* E. coli *B*). (*pp. 179–80*).

By means of a technique resulting in a lowering of the rate of prototroph production in an auxotrophic strain of *E. coli*, the study of mutation was facilitated. It was found that no new mutants appeared in bacteria kept at – 25° C. or + 2° C. and that no new mutants were obtained if the cells were kept at 37° C. in the absence of glucose, while, at the same temperature in the presence of glucose, prototrophs occurred at a rate of 10^{-9} per cell per hour. Mortality rate was zero.

1048 *Matsumoto, K. Morphology of* Aegilops *F_1 hybrids with reference to genome differentiation.* (*p. 181*).

Various ear characters were studied in *Aegilops* F_1 hybrids involving about 90 different combinations. In nine diploid species, the specific characteristics correspond to the respective genomes, while in the tetraploids the specific characteristics are controlled by the second genomes involved in combinations with those of the diploids, and similarly for the third genomes of the hexaploids. The second genomes of the tetraploids are morphologically more differentiated than those of the diploids but the third genomes of the hexaploids show little or no differentiation.

1049 *Matsumura, S., Muramatsu, M. & Sakamoto, S. Genome analysis in* Agropyron, *a genus related to* Triticum. (*pp. 181–82*).

Intrasectional crossing in *Agropyron* was easily effected but intersectional crosses were difficult. Among *Agropyron-Triticum* crosses those between section *Elytrigia* and Emmer or Dinkel wheats were the easiest. *Elytrigia* hybridized with difficulty with Einkorn wheats and *Triticum-Roegneria* crosses were unsuccessful. The F_1 between *A. glaucum* (EEFFJJ) and several Emmer species (AABB) had metaphase configurations varying from $3_{II} + 29_{I}$ to $12_{II} + 11_{I}$ with a mode of $7\text{–}8_{II}$, that of *T. timopheevi* (AAGG) x *T. glaucum* had $2_{II} + 31_{I}$ to $8_{II} + 19_{I}$ with a mode of 5_{II}, and that of *A. glaucum* and two Dinkel species (AABBDD) had $2_{II} + 38_{I}$ to $13_{II} + 16_{I}$ with modes of $6_{II} + 11_{II}$; all these hybrids were sterile. Crosses of *A. glaucum* with *Aegilops longissima* (S^1S^1), *Ae. cylindrica* (CCDD) and *Ae. variabilis* ($C^uC^uS^vS^v$) gave sterile hybrids, the first having $1_{III} + 5_{II} + 15_{I}$ to $10_{II} + 8_{I}$ with a mode of 8_{II} and the others $5_{II} + 25_{I}$ to $10_{II} + 15_{I}$ with modes of $6_{II} + 8_{II}$. From the occurrence of $6\text{–}11_{II}$ in these hybrids, "allosyndesis of several chromosomes between the genomes of *Triticum* or *Aegilops* and those of *Agropyron* may be assumed, which might for the most part belong to the *Triticum* B or the *Aegilops* S genome, partially homologous with the J-genome of *A. glaucum*. Moreover, the possibility of autosyndesis of several chromosomes between the genomes of *A. glaucum* is indicated."

According to the hypothesis of McFadden and Sears [cf. XVII, 166], *A. triticeum* should have the B genome but all seven chromosomes of *A. triticeum* show subterminal centromeres, while those of the B genome in *Triticum* have median or submedian centromeres, as do those of *A. elongatum* and *A. cristatum.*

1050 *Matzinger, D. F., Mann, T. J. & Robinson, H. F. Estimates of genetic variability in flue-cured varieties of* Nicotiana tabacum. (*p. 182*).

C139, a high-yielding variety, poor in flavour and aroma, was crossed with Hicks, which is intermediate in yield and high in quality. In the F_2, ten sets each consisting of four male and four female parents were randomly selected. The progenies from each such set, comprising 16 intercrosses and eight selfings, were evaluated, and "from a comparison of variances of the intercrosses and the selfed progeny, and from the covariance of F_2 plants in crosses versus selfed progeny, estimates of additive x additive epistatic variances were obtained under the assumption of no other types of epistasis." Data were obtained for leaf yield, value per acre, value per 100 lb., date to first flower, plant height, number of leaves, number of suckers, length and width of largest leaf and percentage of nicotine.

1051 *Mazoti, L. B. Inherited preferential somatic segregation in* Zea *conditioned by the cytoplasm.* (*p. 183*).

A pure line carrying the genes *plpl*, determining absence of anthocyanin, in teosinte cytoplasm was back crossed four times to a line carrying *PL PL* in *Zea* cytoplasm. The ratio 37 *PL pl* : 49 *PL PL* was obtained instead of the expected 5*PL pl* : 80 *PL PL*. Back crossing *Pl pl* to *pl pl* gave the ratio 1·022 *PL* : 1·296 *pl* instead of 1 : 1. The excess of *pl* suggests preferential segregation and other data eliminate the possibility that a point mutation had occurred. When the *PL PL* line with *Zea* cytoplasm was back crossed, no deviation from the 1 : 1 ratio was detected, indicating that the cytoplasm is responsible for preferential segregation. Heterozygotes with teosinte cytoplasm were mosaics with nonpurple regions in the panicle. When used to pollinate *pl pl* plants, pollen from these regions gave the ratio 77 *pl pl* : 54 *PL pl*, while pollen from the purple regions gave 22 *pl pl*: 27 *PL pl*.

1052 *McGinnis, R. C. & Campbell, A. B. Fertile triple monosomics from a* Triticum vulgare *cross.* (*p. 184*).

Of eight plants from the cross Redman nullisomic XXI x Prelude, one was monosomic ($20_{II} + 1_{II}$), two were double monosomics ($19_{II} + 2_{I}$) and five were triple monosomics ($18_{II} + 3_{I}$). All were vigorous, partially fertile and almost as tall and early as normal Redman-Prelude hybrids with 21_{II}. In F_2 plants derived from selfed double and triple monosomics, the parental chromosome constitution predominated, the average fertilities being: 62% for the monosomics; 38% for the double monosomics; and 23% for the triple monosomics. One F_2 plant from a triple monosomic parent had $18_{II} + 2_{I}$, indicating that both male and female chromosome-deficient gametes functioned; its growth was normal and its fertility 24%. In an F_3 population from high and low fertility representatives of each deficient F_2 type, an approach to the full 21_{II} complement was observed, but the parental types also occurred frequently enough to permit maintenance of the deficient stocks.

1053 *Michie, D. The "background effect" on phenotypic variability.* (*p. 187*).

It is suggested that different uniform backgrounds, whether genetic or environmental, result in different levels of phenotypic variability. Uniform backgrounds which depart from the norm to which the given species has been adapted in its evolutionary past may be expected to increase phenotypic variance by weakening the "buffering" mechanisms of normal embryonic regulation and thus making the individual members of the population more sensitive to the residual genetic and environmental factors which vary from organism to organism.

1054 *Mikaelsen, K. Comparisons between cytological, physiological and genetic effects of X- and neutron-irradiation in barley.* (*pp. 188–89*).

Comparisons of the effects of X rays and pile neutrons of different energies upon barley seeds show that chromosome breakage was more severe with the latter type of radiation and showed less restitution of broken ends. Respiration rate per unit dry weight was reduced but the rate per unit of active protoplasm was unaffected by radiation as was proteolytic activity in the endosperm. Protein synthesis in the embryo was inhibited by radiation. No qualitative differences in the physiological effects of the two types of radiation were observed, nor were there any differences in the mutation spectra. Differences in biological effectiveness may be explained on the basis of the different ion densities of X rays and neutrons.

1055 *Mizushima, U. & Katsuo, K. Elimination of self-incompatibility in the common cabbage,* Brassica oleracea *L., by means of substitution of nucleus.* (*p. 191*).

A self-compatible strain of an amphidiploid (BC, $n = 17$) developed from a cross between two self-incompatible species, *B. nigra* (B, $n = 8$) and *B. oleracea* (C, $n = 9$), gave rise, on being back crossed to the cabbage parent *B. oleracea*, to three plants which appeared to have diploid cabbage genomes in the *nigra* cytoplasm derived from the amphidiploid. They resembled the cabbage parent in morphology, formed nine bivalents at metaphase I and showed low fertility. After six years' selfing they became highly fertile, with 70% self fertility, and showed no inbreeding depression. When used as ♀ parent in crosses with the original cabbage parent, they give self-compatible progeny, but in the reciprocal cross the progeny is self incompatible, indicating a cytoplasmic effect upon compatibility.

1056 *Morley, F. H. W. Sub-speciation in* Trifolium subterraneum *L.* (*pp. 194–95*).

On the basis of fertility of the F_1 and later generations, twenty Australian strains fell into three groups, A with 16 strains, and B and C with two each. The observation that Mediterranean strains belonged to a larger number of affinity groups, with a smaller proportion in group A, indicates that introductions to Australia came from a restricted part of the original habitat. The pattern of distribution suggests that subspecific differentiation has occurred independently on many occasions and in many localities rather than at a centre of variation.

1057 *Morpurgo, G. & Sermonti, G. Genetic instability in diploid strains of* Penicillium chrysogenum. (*p. 195*).

Nine different unstable clones giving a high percentage of white and yellow sectors have been isolated from colonies obtained by treating a conidial suspension of the green diploid strain of *P. chrysogenum* $\frac{+\ +\ w\ cy}{y\ py\ +\ +}$ with nitrogen mustard. Sectoring disappears completely if conidia from the unstable lines are grown on complete medium plus 8% $MnCl_2$, but, on being replated on complete medium alone, the lines again show sectoring. This effect is not produced by Ca^{++}, Co^{++}, Cu^{++}, Fe^{++}, Mg^{++} or Ni^{++}. $MnCl_2$ also diminishes the percentage of segregants appearing as sectors after treatment with nitrogen mustard.

1058 *Morrison, J. H. The effect of monoiodoacetic acid on cell division.* (*p. 196*).

Treatment of root-tip cells of *Pisum* with monoiodoacetic acid prevents cinetochore cleavage with the result that chromosome movement is inhibited but not the morphological cycle of the chromosomes. The time required for complete inhibition of movement in a given mitotic stage is dependent upon the molecular concentration of the acid. Since iodoacetic acid is known to inhibit the triosephosphate dehydrogenase system in anaerobic glycolysis, it is thought that there may be some relationship between the energy-yielding reactions of glycolysis and mitotic chromosome movement.

1059 *Moutschen, J. Action combinée du Myleran et des rayons X sur les graines de* Vicia faba *L.* (*Combined action of myleran and X rays on* V. faba *seeds*). (*pp. 198–99*).

The application of myleran [1-4 bis-(methylsulphonyloxy) butane] to *V. faba* seeds before or after X irradiation decreases the number of chromosome bridges normally found after X-ray treatment, while the numbers of chromosomal breaks due to the two treatments are additive. The effect of myleran applied after irradiation varies according to the time of application.

1060 *Moutschen-Dahmen, M. & Moutschen, J. Le maintien en première génération des lésions chromosomiques dues à la 8-éthoxycaféine chez* Vicia faba *L.* (*The maintenance of chromosomal lesions due to 8-ethoxycaffeine in the first generation in* V. faba). (*p. 199*).

In studies of the distribution of chromosome lesions in 30 plants grown from seeds treated with 8-ethoxycaffeine and in their 90 offspring, the specific localization of the induced breaks appeared to be maintained from one generation to the next. Although the number of chromosomal aberrations was high, the number of morphological anomalies was low.

1061 *Murray, M. J. Evolution in the genus Mentha.* (*pp. 201–02*).

The genus is generally regarded as comprising five fertile pure species and numerous F_1 combinations, *M. spicata* ($2n = 48$), for example, being considered a hybrid of *M. rotundifolia* ($2n = 24$) x *M. longifolia* ($2n = 24$). It has been found that "the basic fertile species" hybridize freely to give fertile forms ($2n = 24$) resembling sterile *M. niliaca* ($2n = 36$) in appearance but not in oil composition. Neither diploid nor double-diploid hybrids resemble *M. spicata* in appearance. The oil of the basic species and their F_1 hybrids contains the ketones piperitone oxide and piperitenone oxide, while that of *M. spicata* may contain the same or carvone and hydrocarvone or menthone and pulgeone. The evolution of the ketone differences is due to the mutation and interaction of two dominant genes, but the exact parentage of *M. spicata* is unknown. *M. piperita* ($2n = 72$) is synthesized by crossing *M. aquatica* ($2n = 96$) with menthone and pulgeone strains of *M. spicata*.

1062 *Murty, B. R. & Bhat, N. R. Male sterility in* Nicotiana tabacum. (*p. 202*).

Of two duplicate factors controlling male sterility in a spontaneous mutant, one results in malformation of the anther so that the development of sporogenous tissue is restricted and the other operates only in succession to the first, causing abnormal tapetal development and meiotic irregularities. Partially sterile offspring always segregated into 1 normal : 2 partially sterile : 1 completely sterile, indicating that they are heterozygous for one gene and homozygous and recessive for the other. Reduction in size and width of the corolla tube was regularly associated with male sterility in all families.

1063 *Navashin* [*Navašin*], *M. S. Cell size and development of characters.* (*203–04*).

Measurements have shown that the volume of various organs in tetraploids is only about 1·6 times that in diploids, although cell volume is twice that of diploids. Since 1·6 is approximately equal to $\frac{2}{\sqrt[3]{2}}$ and since the decrease in relative surface area of the meristematic cells is proportional to $\frac{1}{\sqrt[3]{2}}$, ultimate cell number in the tetraploid will be $\frac{2}{\sqrt[3]{2}}$ times that of the diploid, assuming that the decrease in rate of division in the tetraploid is proportional to the decrease in relative cell surface. The hypothesis was verified in studies of diploid, triploid and tetraploid individuals of *Taraxacum kok-saghyz*, in which the numbers of cells composing the pappus hairs were inversely proportional to the cube roots of the corresponding cell volumes.

1064 *Nelson, O. E.* (*Jun.*). *Intercrosses among alleles at the waxy locus in maize.* (*p. 204*).

Pollen grains carrying *Wx* stain blue-black with iodine solution, while those with *wx* stain reddish brown. In studies of the pollen produced from all possible crosses between six independently occurring mutations at the *Wx wx* locus, some crosses showed an increase in the number of black-staining grains compared with the parent and some showed none. The incidence of black-staining grains in the parents was 0·42 x 10^{-5}–1·37 x 10^{-5}.

1065 *Nuffer, M. G. A crossover analysis of mutable alleles at the* A *locus in maize.* (*p. 206*).

"In order to determine the nature of the factors involved in mutable behavior at the A_1 locus a heterozygote composed of two distinguishable mutable alleles, one *Dt*-influenced and one *Ac*-influenced, but lacking these mutator factors, was prepared." One segment carried *a a sh* (total map distance 0·25), *a* being a *Dt*-responding component of the A_1 locus. The other segment carried a^{m}—1, a^{m-3} or a^{m-4}, the first being a *Dt*-responding highly mutable component of *A* and the other two *Ac*-responding alleles, together with *Sh*. "The heterozygote was crossed by the complete recessive a^{s} *sh*. Progeny from the a^{m}—1 heterozygote included the crossover types *a* a^{m} *Sh*, *a a Sh*, *a-Sh*, a^{m} *sh*, *a sh*, and a^{m} *a sh* which showed that pairing was random at the *A* locus in this case. The phenotype of the a^{m} *a sh* crossover cases indicated that the two mutable alleles can mutate independently even when closely associated on the same chromosome segment. Progeny from the a^{m-3} and a^{m-4} heterozygotes gave similar crossover types except that the *a* a^{m} *Sh* class was missing (the reciprocal *a sh* class was indistinguishable), suggesting preferential pairing. The frequency of crossing-over was strikingly different in the a^{m-3} heterozygotes. The rates expressed in crossover units were a^{m}—1, .11; a^{m-3}, .013; and a^{m-4}, .079. This may be due to the type of event involved in the origin of a^{m-3}. Preliminary investigations reveal no change in the mutability or phenotype of these alleles that can be attributed to crossing over."

1066 *Olah, L. V. Cytological investigations in* Corypha *palms.* (*p. 208*).

[Cf. 1789].

1067 *Olive, L. S. & Carr, A. J. H. Crossing self-sterile mutants of* Sordaria fimicola. (*pp. 208–09*).

In studies of spontaneous and irradiation-induced mutants showing partial or complete sterility, analysis of crosses of self-sterile mutants has shown that in some crosses sterility is controlled primarily by two nonallelic linked loci, one in each parental strain. In other crosses one parental strain carries a single locus for sterility and the other two, both of which cause ascospore germ tube abortion. Since these crosses involve nonallelic mutant loci and yield some self-fertile recombinants, they represent an unbalanced heterothallism. It is suggested that balanced heterothallism may have arisen repeatedly in nature by crossing over within a sterility locus in a cross of sterile with wild-type forms or by the pairing of heteroallelic sterile mutants.

1068 *Ono, H. Chromosome breakage induced by hybridization. (p. 209).*

The caryotype of *Paraixeris denticulata* ($n = 5$) x *Lactuca squarrosa* ($n = 9$) fluctuates between 10 and 14 chromosomes, apparently as a result of fragmentation and elimination of paternal chromosomes in the maternal cytoplasm. Caryotypes with 12 chromosomes are most abundant. The chromosomes which break most frequently have been identified.

1069 *Paliwal, R. L. & Hyde, B. B. The association of a single B-chromosome with male sterility in* Plantago. *(p. 212).*

In *P. ovata* ($2n = 8$) male sterility is cytoplasmically determined. In *P. coronopus* ($2n = 10$ or $10 + 1$) male sterility was associated with the presence of a B chromosome and male-sterile plants appeared to be facultatively apomictic.

1070 *Pandey, K. K. Microsporogenesis, time of S allele action, pollen cytology and place of inhibition and their relationship with the evolution of gametophytic and sporophytic systems of self-incompatibility. (pp. 212–13).*

[Cf. XXVIII, 3643].

1071 *Person, C. A study of asynapsis and its effect on subsequent chromosome behavior. (pp. 215–16).*

In meiotic cells of a barley plant ($2n = 14$) showing complete lack of pairing from prophase onwards, distribution of the univalents to the poles was random.

1072 *Pfahler, P. L. & Janick, J. A proposed method for the determination of dominance levels. (pp. 216–17).*

"A method of determining the level of dominance by the use of euploidy and aneuploidy is proposed. If tetraploids can be produced artificially from homozygous diploid inbreds AA and BB, the triploids, AAA, BBB, AAB and ABB, could be synthesized from appropriate crosses. The mean of the triploid hybrid AAB can be partitioned into three main effects: (1) the mean of the diploid hybrid, AB; (2) the effect of triploidy, 2 (AAA–AA) + (BBB–BB)/3; (3) any effect, designated I^{gA}, brought about by the additional A genome. The I^{gA} value can be estimated by the following equation: $I^{gA} = \text{AAB} - \text{AB} - [2(\text{AAA} - \text{AA}) + (\text{BBB} - \text{BB})/3]$. The I^{gB} value for the triploid hybrid ABB can be estimated similarly. The level of dominance can be estimated by a comparison of the sign and magnitude of the I^{gA} and I^{gB} values. If the mean of the diploid hybrid AB were within the range of both parental means, indicating additive or partially dominant gene action, the sign of I^{gA} and I^{gB} would be positive. The difference between the I^{g} values would indicate a difference in the contribution of dominant alleles from each parent. If the mean of the diploid hybrid AB were as large or larger than either parent, dominant or overdominant gene action would be operative. If gene action were dominant, the I^{gA} and the I^{gB} values would be zero. If gene action were overdominant owing to divergent physiological function of alleles, the I^{gA} and the I^{gB} values would be positive. If the gene action were overdominant owing to optimum level of gene product, the I^{gA} and I^{gB} values would be negative. If the production of trisomics were possible, a similar analysis could be employed to partition the I^{g} effect into individual chromosomal components. The results obtained by this method would not be influenced by epistasis or linkage."

1073 *Pittenger, T. H. Mitotic instability of pseudo-wild types in* Neurospora. *(pp. 218–19).*

Pseudowild types (PWT) contain unstable disomic nuclei which undergo a form of mitotic breakdown to give genetically different haploid nuclei. Analysis of the nuclear ratios present in mycelia derived from two or more individual hyphae from opposite ends of PWT ascospores from a cross of *lys*–3 x *nic*–2, *al*–2 showed that reduction takes place during early nuclear division inside the ascospore. "That it is very often, but not always, the first nuclear division within the ascospore that is abnormal is shown by a comparison of the frequency of PWTs and recombinant wild types in irradiated and non-irradiated populations. In populations in which the number of viable nuclei per spore had been effectively reduced from two to one by X-irradiation, the proportion of phenotypically wild types which were PWTs was significantly reduced, suggesting that many binucleate PWT spores were already heterokaryotic."

1074 *Prakken, R. & van der Veen, J. H. Flower variegation and seed quality in* Nicotiana tabacum. *(p. 221).*

The following genotypes have been distinguished: *Vp1Vp1vp2vp2* and *vp1vp1Vp2Vp2*, pink flowers; *vp1vp1vp2vp2*, pale pink variegated flowers and shrivelled seeds; *PkPk Vp1Vp1 Vp2Vp2*, carmine; *whwh PkPk Vp1Vp1 Vp2Vp2*, white; and *WhWh pkpk vp1vp1 vp2vp2*, pink variegated. The F_2 of the cross between carmine and pink variegated gave 45 carmine : 3 carmine variegated : 15 pink : 1 pink variegated. The variegated carmine plants were variable in size of white or coloured spots and intensity of colour and showed positive parent-offspring correlations in degree of variegation. Degree of variegation was also correlated with seed quality. Recessive white plants (*WhWh vp1vp1 vp2vp2*) could be recognized by their shrivelled seed.

1075 *Priadcencu, A., Tarnaski, I., Melacrinos, A., Melber, D., Boldea, E. Quelques formes nouvelles de plantes obtenues par des croisements éloignés entre céréales. (Some new forms of plants obtained by means of distant crosses among cereals). (p. 222).*

The following material developed in Rumania is described. From crosses of autumn wheat with durum wheat, a speltoid hybrid with $2n = 35$ has been obtained. The modal metaphase configuration is $17_{II} + 1_{I}$. Crosses between autumn wheats and Petkus rye, back crossed to both parents, have led to the development of a hybrid named *Neo-Secalotriticum*, with $2n = 56$ and 28 bivalents. An F_1 of *Triticum vulgare* var. *erythrospermum* x *T. durum* var. *valenciae* crossed with *Aegilops ovata* has given a stable hybrid called *Neo-Aegilotriticum* with $2n = 42$.

1076 *Price, S. Chromosome numbers transmitted by* Saccharum officinarum. *(pp. 222–23).*

In intraspecific crosses, *S. officinarum* ($n = 40$) rarely if ever transmits its diploid number maternally, the hybrids produced being euploids or related aneuploids of the $n + n$ type. In crosses with *S. spontaneum* ♂ ($n = 32$, 40, 56 or 64), the diploid complement was generally transmitted through the mother, giving diploids or aneuploids of the $2n + n$ type, but in one case one $n + n$ hybrid was obtained from a cross involving *S. spontaneum* with $2n = 40$. These observations indicate that, if both $n + 2n$ eggs are present in *S. officinarum* at the time of fertilization, selective fertilization or differential survival must occur. Alternatively, there may be failure of egg and sperm nuclei to enter synchronously into the first division of hybrid zygotes.

1077 *Pritchard, R. H. Recombination and negative interference in* Aspergillus nidulans. *(pp. 223–24).*

"The following hypothesis accounts satisfactorily for the data from *Aspergillus* and similar observations in other organisms. In any one cell the necessary conditions (effective pairing) for recombination are restricted to very short, discontinuously distributed segments of the genetic material. In a population of cells these segments will be distributed over the whole genome. Coincidence values greater than unity will be obtained for two adjacent intervals whose combined length is not much greater than the mean length of effectively paired segments since in most cells neither interval will be effectively paired, but when one interval is effectively paired, the effective pairing segment will usually cover both intervals, leading to a positive correlation between exchanges in the two intervals.

"The recombination fraction between markers relatively far apart will depend on the frequency of effective pairing in the interval, and the frequency of exchanges within effectively paired segments. Interference operative over long intervals would result if effective pairing at one point influenced the probability of effective pairing elsewhere.

"In *Aspergillus* preliminary data indicate that effective pairing segments are variable in length with a mean of about 0·3 map units. The mean number of exchanges per segment is between 1 and 2. The location of the segments is variable but may not be random."

1078 *Quintanilha, A. Mendelism and Michurinism. (pp. 225–26).*

Mičurinist theory as elaborated by Lysenko is attacked and it is contended that Mičurin's most important horticultural successes were obtained through the use of Mendelian methods.

1079 *Ravin, A. W. Specificity in the efficiency of response by* Pneumococcus *to different transforming agents. (pp. 228–29).*

When a recipient strain of *Pneumococcus* is treated with DNA from a donor strain differing in certain inherited characteristics, the former may be transformed for any or all of these characteristics. It has now been found that not all the markers are acquired by the host strain with the same efficiency. A multiplying population deficient for capsule synthesis and sensitive to streptomycin and erythromycin was treated for 15 min. with DNA from another clone of the same strain which had previously been transformed so that it was encapsulated and resistant to certain concentrations of erythromycin and streptomycin. After the host population had been diluted in a medium containing DNase, a series of parallel cultures were set up using inocula which rarely contained more than one bacterium capable of giving rise to transformed progeny. The marker affecting capsule synthesis was found in the greatest number of parallel cultures, the marker controlling resistance to erythromycin being almost as frequent, but the marker responsible for streptomycin resistance was much less frequent. These differences were independent of the total transformation frequency and were not caused by any genetic heterogeneity in the donor population. It is stated that "the extent of these differences is a function of the specific markers employed, for there are several different markers affecting various levels of antibiotic resistance and varying extents of capsule synthesis. A group of three markers for these characters can be selected, however, such that the observed differences in 'uptake' are regularly large and significant."

It was also shown that differences in "uptake" are not due to differences in the times required for phenotypic expression of each of the markers.

1080 *Richter, A. A. Recombination analysis of mating type in* Escherichia coli *K12.* (*p. 232*).

"An F– strain ♀$_3$, was previously reported to be convertible, upon exposure to F+ cells, to the Hfr$_3$ mating type, here termed ♂$_3$, which displays high frequency of segregation for markers in region 3 (*Th M Xyl S*). It was shown that the ♂$_3$ phenotype depends upon the presence of the transmissible agent F and a gene Hfra$_3$ + which does not recombine with a marker Mal_5. From a cross of ♂$_2$ (Hayes Hfr strain) x ♀$_3$, four mating genotypes are recovered, the two parental types, standard F— (convertible to standard F+), and a type referred to as compound male. The same cross demonstrates that the ability to yield infectious F agent does not recombine with the ♂$_2$ quality. One may therefore postulate that the F agent of ♂$_2$ resides at a locus Hfr_2, thereby determining the ♂$_2$ phenotype. Hfr_2 is defined by its position in the following sequence: *Gal Lac P L T* Hrf_2 Hfr_3 *Th M Xyl S*. The compound male type has the following properties in common with ♂$_2$. (1) In crosses with F—, it displays high frequency of segregation for markers in region 2 (Hfr_2 Mal_5 *Th M Xyl S*). (2) It is stable as shown by the fact that the vast majority of progeny from crosses x F— are F—. (3) The quality recombines with Mal_5. It is possible to distinguish the compound male from ♂$_2$ by the fact that Hfr$_3$ segregates in crosses of compound male x F—. The new mating type therefore carries both the determinant of the ♂$_2$ property (F present at Hfr_2) and the determinant of the ♀$_3$ property (Hfr_3^+)."

1081 *Rick, C. M. Disturbed segregation in progenies of* Lycopersicon esculentum *x* L. chilense (*pp. 232–33*).

Meiosis appeared to be normal and about half the pollen aborted in several F$_1$ hybrids between *L. esculentum* homozygous for markers *a*, *c*, *d* and l_1 on four chromosomes and a stock of *L. chilense* carrying the corresponding dominant alleles. Thd F$_1$ hybrids were self incompatible and F$_2$ progenies were only obtained by crossing intercompatible hybrids; a back-cross generation was also obtained using *L. esculentum* as the female parent.

Recessive homozygotes were generally deficient in the F$_2$ and in excess in the BC. The degree of deviation from *L. esculentum* controls was highly significant for *d* and l_1 and less marked for *a* and *c* in both the F$_2$ and BC; the deficiencies in the F$_2$ are said to be in accord with a shift towards *L. chilense* observed in distributions of quantitative species-differentiating characters. Also, significant heterogeneity was observed between BC progenies for *a* and l_1 but not for *c* and *d*; this heterogeneity is thought to be due to differential survival, germination being variable and never exceeding 25%. In the F$_2$ there was a general but nonsignificant tendency towards association between parental character combinations; a similar less consistent trend was observed in the BC. In some second BC families the segregations were almost normal. The disturbed segregations could not have been solely caused by imperfect penetrance and differential survival of gametes during maturation because of the opposing deviations in the BC and F$_2$ generations. It is however possible that differential pollen growth or zygotic elimination were responsible.

1082 *Rieger, R. & Michaelis, A. The induction of automutagenic substances by submersion of* Vicia faba *seeds in tap water.* (*p. 233*).
[Cf. 853 and 2049].

1083 *Riley, R. Chromosome pairing and haploids in wheat.* (*pp. 234–35*).

"Four kinds of haploid have been obtained in *Triticum vulgare* var. Holdfast (6*x* = 42) from lines involved in making additions and substitutions of single pairs of rye chromosomes.

(1) Euhaploids with 21 chromosomes had the complete haploid chromosome set of wheat. (2) Two types of 22-chromosome addition haploid had the haploid complement of wheat plus one rye chromosome. (3) Three types of 20-chromosome nulli-haploid had the haploid set of wheat chromosomes minus one. (4) One 21-chromosome substitution haploid had 20 chromosomes of the haploid set of wheat plus one rye chromosome. At first metaphase of meiosis in euhaploids, in the addition haploids, and in one of the nulli-haploids, there were mean bivalent frequencies of 1·0 to 1·7 per cell, and there was little difference between the three classes. Nulli-haploids of the second type, and the substitution haploid with the same 20 wheat chromosomes, had fewer bivalents than euhaploids (mean 0·7 to 0·9 per cell), suggesting that the missing chromosome often participated in bivalent formation in euhaploids. However, in the third nulli-haploid there was a mean of 4·2 bivalents and 0·8 trivalents per cell. Cells with three trivalents were not uncommon and 29% of cells had five to seven bivalents, in contrast to the other haploids examined in which trivalents were very rare and not more than four bivalents per cell were formed. Further, in this nulli-haploid 20% of the total bivalents were rings, whereas no more than 4% were rings in the other haploids. It seems, therefore, that the chromosome deficient in this nulli-haploid carries a gene which reduces pairing, so restricting association between homologous chromosomes. Such a gene would have selective value in hexaploid wheat for the effect which cytologically diploid behavior would have on fertility and genetic stability."

1084 *Rizet, G. Un nouvel ascomycète intéressant pour les généticiens,* Ascobolus immersus. (*A new ascomycete interesting to the geneticists,* A. immersus). (*p. 236*).

A. immersus and *A. stercorarius* are considered to be suitable material for a variety of genetical studies. Already more than 80 spontaneous mutants differing in ascospore characters have been isolated; the ascospores of *A. immersus* are very large and particularly easy to isolate. Many anomalies in segregation have been observed, some of these being ascribed to conversion. Information is provided on linkage and allelic series found in *Ascobolus.*

1085 *Roberts, M. R., Dissosway, C. E.-R. & Plough, H. H. Evidence for linear order of transducible loci and prophage sites in* Salmonella typhimurium. (*p. 238*).

Transduction on to a substrain of 533 was studied using phage derived from 549 cells now known to be doubly lysogenic for phage 549t and 549m; the loci histidine (H^-), tryptophane (T^-) and leucine (L^-) on 533 were used. Transduction frequencies per 10^8 cells at approximately the same multiplicities are shown in the following data: 549 (549t) + 533 $H^-T^-L^-$ gave 27·6 H^+, 13·8 T^+, 2·6 L^+; 533 (549t) + 533 $H^-T^-L^-$ gave 73·0 H^+, 217·3 T^+, 7·4 L^+. Such results are explained by assuming a constant linear arrangement of the loci, the frequency of transduction being in inverse relation to the proximity of any locus to the transducing prophage site. "Differences in frequency of lysogenization of the three types of transduced cells in each series are directly related if the principal prophage sites are transposed. Actually the prophage sites for phages 549t and 549m have apparently been reversed in 549 and 533 strands".

Map order for the 549 and 533 series are indicated as follows, the prophage sites being in parentheses: 549, (549m) H^+T^+ (549t) L^+; 533, (549t) H^+T^+ (549m) L^+. No other arrangement satisfies the available data.

1086 *Robinson, H. F., Cockerham, C. C. & Moll, R. H. Genetics and genotype-environmental interaction variances in maize.* (*p. 239*).

It is pointed out that the magnitude of interactions between genotype and environment relative to the genotypic variance is of importance in deciding which breeding procedures to follow, when the value of these depends on the usable genetic variances.

A report is presented of attempts to measure genotype-environmental interaction variances that may contribute to "biases" in estimates of genetic variances in maize populations. A series of half-sib families were tested in five locations over a series of years, interaction variances of genotype x years, genotypes x locations and genotypes x locations x years being estimated. In such a study it is possible to examine the contributions of subregional fluctuations of the environment to genotype-environmental interactions. The findings of this study were compared with other estimates of genetic variances and of variances arising from genotype-environmental interaction.

1087 *Roper, J. A. Genetic analysis of cytoplasmically determined variation in* Aspergillus nidulans. (*pp. 240–41*).

The substance of this paper is similar to that of one already summarized from another source [cf. 39].

1088 *Ross, J. G., Franzke, C. J. & Sanders, M. E. The immediate induction of homozygous diploid mutants in sorghum.* (*p. 241*).

True-breeding, diploid mutants have arisen by colchicine treatment of seedlings of the sorghum lines Experimental 1 and Experimental 3; it has been suggested that in the latter the mutant condition could have arisen through concentrations of chromatin from the ancestors, a somatic reductional division restoring the diploid number.

In order to test the first part of this hypothesis, meiotic pairing relationships were studied in true-breeding mutants and in F_1 hybrids between mutants and their untreated full sibs. The lack of irregularities indicated that there was no major relocation of chromatin in the mutants; also genetic analyses of F_2 populations suggested that the genotypic changes had arisen from point mutations. Evidence of at least 13 changed genes was provided by a study of an F_2 population from one of the mutant x untreated sib crosses. A linear series of diploid mutants all showing normal meiosis was induced by colchicine treatment of each successive new mutant; this provided further evidence for the mutagenic action of colchicine.

The second part of the hypothesis was tested by treating seedlings heterozygous for certain chromosome markers with colchicine. Some sorghum lines failed to produce obvious true-breeding diploid mutants after treatment and other lines known to give mutants did not always do so. However the appearance of homozygous shoots after colchicine treatment of F_1 flax plants heterozygous for known genes provided support for the hypothesis. Either the genotype or the environment may be responsible for failure to find homozygous shoots after treatment of heterozygous material; in this connexion, the effects of various environmental factors are being studied. Diploid mutants may be produced by colchicine treatment in an unshaded greenhouse or under infrared radiation.

1089 *Rudorf, W. Genetics of* Phaseolus aborigineus *Burkart.* (*p. 243*).

In a line of *Ph. aborigineus* from Tucumán, the genetics of the short-day reaction controlled by *neu*$^+$ was studied. In short-day plants, the *in*$^+$ factor for indeterminate growth segregates in a 3 : 1 ratio. This factor *in*$^+$ also causes a definite retardation of flowering as compared with *in*. Short-day plants of indeterminate growth have the genotype *in*$^+$ *neu*$^+$ and indeterminate day-neutral plants have *in*$^+$ *neu* whereas determinate day-neutral plants have either *in neu*$^+$ or *in neu*. A study of the F_3 revealed that *in* is epistatic to *neu*$^+$.

The line of *Ph. aborigineus* under consideration has shown resistance to the four known races of *Colletotrichum lindemuthianum*. Plants are considered to be susceptible if they die after infection by the four races and resistant if they either show no signs of infection or recover completely. On this basis, crosses between susceptible and resistant plants segregate 9 resistant : 7 susceptible for races α, γ and δ of the pathogen and 3 resistant : 1 susceptible for race β.

Segregation in quantitative characters such as length and width of pod and weight and size of seed is similar to that of crosses between varieties of *Ph. vulgaris*.

Crosses between *Ph. aborigineus* and *Ph. vulgaris* give fertile hybrids when crossed, segregation being quite normal. It is thought that the genomes of these two species are homologous and that the cultivated species arose from the wild form by a series of mutations.

1090 *Ryan, F. J. Mutation as an error in gene duplication.* (*p. 246*).

Mutants have appeared in stationary phase populations of *Escherichia coli* and it has been shown that these mutations do not occur during the cryptic growth of cells involved in a population turnover.

It is thought possible that polymer synthesis continues in nondividing cells and that this synthesis is connected with gene mutations. In order to test this theory, nondividing bacteria were treated with drugs such as chloramphenicol and growth factor analogues; other strains which were mutant at the locus under investigation and biochemically deficient were starved of the nutrients they required. The rate of occurrence of stationary phase mutations under these treatments was compared with that in untreated cultures. The results indicated that polymer synthesis is necessary for these mutations, some clues being provided as to the substances involved; thus support is given to the view that gene duplication is necessary for most mutations occurring in the absence of cell division.

1091 *Sánchez-Monge, E. Rye genome in "Terminillo" wheat.* (*pp. 248–49*).

Both the wheat Rieti and Terminillo, which originated from the back cross (Rieti x rye) x Rieti, can be classified botanically as *Triticum* *aestivum* var. *erythrospermum.* Certain morphological differences existing between these two forms are assumed to be the result of introgression of rye genes into Rieti wheat; morphological and cytological proof of such introgression is available.

1092 *Savitsky, H. Chromosome behavior in interspecific hybrids between* Beta vulgaris *L. and species of the section* Patellares *Tr.* (*pp. 250–51*).

Meiosis was studied in a sterile hybrid of Swiss chard ($2n$) x *B. webbiana* ($2n$) and a semifertile hybrid of Turkish leaf beet ($2n$) x *B. procumbens* ($2n$), these hybrids having been bred by Gaskill and Oldemeyer respectively. The semifertile hybrid showed slightly more chromosome pairing and higher chiasma frequencies than the sterile hybrid; in the former hybrid, division of univalents and bivalents and a regular and equal distribution of chromosomes in the first meiotic division resulted in some gametes having almost a complete set of chromosomes from both species. Whereas haploid gametes containing a few chromosomes from both species were not viable, some diploid or near diploid gametes, probably bearing a complete haploid set of the chromosomes of one species, were viable. The progeny was either triploid or nearly triploid. The meiotic abnormalities observed included chromosome breakage, bridges, telocentric and acentric fragments, non-disjunction, multipolar spindles and fused spindles.

1093 *Savitsky, V. F. Differences in interaction of cytoplasm-genes in different male-sterile races in* Beta vulgaris *L.* (*p. 251*).

In repeated back crossing of various hermaphrodite populations to monogerm beets, it was found that some hybrid populations segregated for male sterility, this sterility being due to the interaction of male-sterile cytoplasm and certain nuclear factors which do not restore pollen fertility in the presence of male-sterile cytoplasm. "Genetic analysis of hybrids indicated that the appearance of male-sterile plants in backcross hybrids was caused by the presence of male-sterile cytoplasmic races in the multigerm hermaphrodite populations and elimination of the existing system of dominant genes which restored pollen fertility in these male-sterile cytoplasmic races. The process of substitution of dominant genes for recovery of pollen fertility by the genes causing abortion of pollen grains occurs faster in monogerm plants, because of linkage between non-recovery genes and the gene *m* (monogerm character). It is demonstrated that male-sterile cytoplasm isolated from different populations differs in this reaction to nuclear genes which do not restore male-fertility. These differences between plasms in the manifestation of the grade of male-sterility and in the interaction plasma-genes did not change during eight backcrosses and eight generations of selection for male sterility within male-sterile lines. Different expressions of male sterility in *B. vulgaris* L. are caused by different genes which influence the cytoplasm, as well as by the different types of male-sterile cytoplasm."

1094 *Schecroun, J. Sur la réversion provoquée d'une modification cytoplasmique chez* Podospora anserina. (*On the induced reversion of a cytoplasmic modification in* P. anserina). (*pp. 252–53*).

[Cf. XXVIII, **3673**].

1095 *Schmalhausen, I. Hereditary information and its transformations.* (*p. 253*).

The mechanism of evolution is described in terms of cybernetics [cf. **1163**].

1096 *Scholz, F. Smooth-awned barley mutants induced by X-rays.* (*p. 254*).

The high-yielding mutant strains produced at Gatersleben include several forms with semi-smooth awns and one with completely smooth awns; another smooth-awned mutant is partially sterile [cf. XXVIII, **1653**].

Crossing the mutants with one another as well as with Haisa, from which most of them are descended, gave evidence of three independent recessive genes for semismoothness of the awns; the completely smooth condition is controlled by a multiple allelic series, independent of the genes for semismoothness. A dominant allele is responsible for the rough awns of Haisa whilst the smooth-awned mutants **4033** and **4043** each carry a recessive allele conferring the same grade of smoothness; the allele of **4034** is recessive to that of **4033** and is also responsible for partial sterility and probably hairless stigmas.

It is pointed out that in one locus there may be various mutations for smooth awns affecting hairiness of stigmas and fertility differently; studies on allelic relations to *r* genes were started.

1097 *Schwemmle, J., Arnold, C. G. & Glenk, H. O. Preuve et bases chimiques de la fertilisation sélective chez les Oenothères.* (*Proof and chemical basis of selective fertilization in* Oenothera). (*p. 256*).

It has been shown in various species of *Oenothera* that the ovules secrete chemical substances which attract the pollen tubes, the force of attraction varying with the genotypes of the gametes [cf. XXVIII, 3780 and 3781].

1098 *Sears, E. R. & Okamoto, M. Intergenomic chromosome relationships in hexaploid wheat.* (*pp. 258–59*).

Triticum aestivum has 21 chromosomes which can be placed in seven homologous groups of three according to the ability of tetrasomes to compensate for particular nullisomes. It is stated that within these groups all the 42 possible tetrasomic-nullisomic combinations are nearer normal than the nullisomics themselves, whereas of nearly 50 intergroup combinations, none have shown compensation. It is thought that each chromosome is similar to its two homologues in gene content; however very little pairing is found between them.

Of 13 translocations recovered from haploids, nine involved homologous chromosomes. These were: VI–XIX (4 occurrences), II–XX (2), XI–XXI (2) and XII–XVI.

Chromosome V seems to suppress pairing of homologous chromosomes for when chromosome V is missing hybrids between wheat of the genomic formula AABBDD and the amphidiploid *T. aegilopoides* x *Aegilops squarrosa* (AADD) have microsporocytes with an average of 12 bivalents, the corresponding value being eight when chromosome V is present. Similarly, hybrids between the genomes AABBDD and AA usually have two to seven pairs, the average number rising to 10 in the absence of chromosome V. It is suggested that diploid pairing in hexaploid wheat has resulted from a mutation on chromosome V responsible for a decrease in pairing intensity. There is clearly less intense pairing in hexaploid wheat than in diploid wheat.

1099 *Sermonti, G. & Morpurgo, G. Chemioreactivation in* Penicillium chrysogenum. (*p. 259*).

It was found that diploid conidia of *P. chrysogenum* inactivated by a nitrogen mustard (HN–2) could be reactivated by $MnCl_2$ added to the plating medium, the effect being much less on haploid conidia. Conidia inactivated by ultraviolet or X irradiation are not reactivated by $MnCl_2$. The rate of somatic segregation induced by HN–2 in heterozygous diploid conidia can be reduced by $MnCl_2$ which also inhibits the spontaneous segregation of HN–2 - induced unstable clones.

1100 *Serra, J. A. Two-dimensional composite nature of the gene.* (*pp. 259–60*).

The gene is thought to consist of one to several segments of chromonema [cf. XXIX, 63]. "Gene mutations and position effects of the mimic type consist in changes in the contacts between successive segments, respectively within and between the genes. Other position effects are of the pure type, not mimic to known gene mutations. Pure position effects are potentially new genes, and repeats should provide the most frequent process of their origin".

Each gene is composed of several fibrils; electron micrographs have shown six to eight orders of fibrils, each fibril being composed of two of an inferior order. Gene conversion or mutation can be explained by the sorting out or cross sorting of different fibrils within a gene during a cross over. Negative chromatid interference, somatic cross over and some cases of gene instability may also be explained by sorting out of the fibrils.

1101 *Sharma, A. K. Aesculin: its use in detecting double fertilization and chromosome structure of various organs of plants.* (*p. 260*).

In the schedule described, ovules are treated with 3% esculin solution at 10–12° C. for 3 hr., fixed in 1 : 1 acetic alcohol for 30 min. and heated for a few seconds in a 9 : 1 mixture of 2% acetoorcein solution, when the number of chromosomes in embryo and endosperm becomes clearly distinguishable; the morphology of the chromosomes is also clearly shown. This staining procedure is completed within four hours. Esculin has also proved suitable for the study of pollen grain chromosomes.

In the same plant, the concentration of esculin and the period of treatment necessary for making the chromosome structure clear varies considerably in different organs.

1102 *Singleton, W. R. & Caspar, A. L. The Blandy radiation field for inducing mutations in plants.* (*p. 261*).

"The Blandy radiation field, or pit, is designed to give short rather than long exposures of chronic radiation. Plants are grown in pails and moved to the radiation area which consists of a paved circle 30 feet in diameter, shielded by a concrete retaining wall and an earthen embankment. The 125 curie Co^{60} machine is located in a dry well in the center of the field. The source is raised by remote control through a stainless steel pipe to the operating position. A 'sky shine shield' consisting of three tons of concrete blocks on an oak table limits the radiation upward that would be reflected to earth by particles in the atmosphere."

1103 *Sinotô, Y. Graft experiments on egg-plants.* (*p. 262*).

Twenty successful grafts were made of the blue-fruited variety Kantoao [Kanto Blue] on to Shinkuro, which has black fruits; of the 16 scions which bore fruit, nine had blue fruits and the other seven had black fruits. Shinkuro was also grafted on to Kantoao; in two cases the fruits of the stock were blue, whereas in another two the fruit, leaves and other parts of the stock changed to black. Selfing of the Kantoao scion bearing black fruits resulted in a segregation in the progeny of 25 blue-fruited plants to 10 with black fruits.

1104 *Smith, B. W. Polyploidy, hybridization and sexuality in dioecious* Rumex hastatulus *and* Rumex paucifolius. (*pp. 264–65*).

R. hastatulus and *R. paucifolius* differ markedly from each other and from *R. acetosa* in chromosome number and morphology. *R. hastatulus*, an annual weed of the Southeastern Coastal Plain, has homogametic females ($n = 3 + X$); the males are heterogametic ($n = 3 + X$ or $3 + Y_1Y_2$). The combination $3A + 2X + Y_1Y_2$ produced a unisexual male, whereas $4A + 3X + Y_1Y_2$ was responsible for males and male intersexes. These results indicate an X/A balance with a critical value near 0·75; the possibility that the Y chromosome influences sex determination is not excluded.

R. paucifolius, a perennial subalpine of the western mountains, has at least two chromosome races, $2n = 14$ or 28, the 28-chromosome forms being autopolyploid. No heteromorphic sex chromosomes have been observed.

F_1 hybrids obtained from reciprocal crosses between the two species were diecious, no intersexes occurring; six of the 51 hybrids produced no flowers. With *R. paucifolius* as the pollen parent, each hybrid received 18 chromosomes, sex being determined by heterogametes from *R. paucifolius*. In the reciprocal cross, female hybrids had 14 chromosomes from *R. paucifolius* and four from *R. hastatulus*; the 19-chromosome males received five chromosomes ($3 + Y_1Y_2$) from *R. hastatulus*. As the *R. paucifolius* bivalents disjoined during metaphase I in PMCs, the *R. hastatulus* univalents divided. Only 50 viable F_2 back-cross and open-pollinated seeds were obtained from a large number of flowers; in the progeny new combinations of parental chromosomes occurred.

1105 *Smith, H. H. Limits and consequences of multiple allopolyploidy in* Nicotiana. (*p. 265*).

Crossing the amphidiploid *N. debneyi-tabacum* ($n = 48$) with *N. bigelovii* ($n = 24$) and doubling the chromosome number with colchicine gave a multiple allopolyploid ($n = 72$). Three distinct races of this allopolyploid have undergone self pollination and selection for 10 generations. The races differ in their aneuploid chromosome numbers ($n = 50$ to 60). Certain meiotic irregularities persist but pollen abortion has been reduced to 3·7% in race A, 15·7% in race B and 8·5% in race C. A differs from B in 10 and from C in 8 of the 15 characteristics measured; races B and C differ in 9 characteristics. Differences were also noted between the races in their crossability with the parent species.

1106 *Srb, A. M. Different expressions of a nuclear gene in combination with different* Neurospora *cytoplasms.* (*p. 271*).

When a spontaneous mutant of *N. sitophila* with an aconidial phenotype was crossed reciprocally with wild type *N. sitophila*, the segregation patterns in the progeny indicated a simple allelic difference between the mutant and wild type. The aconidial mutant was also crossed reciprocally with a stock carrying an *N. sitophila* nuclear genome and SG-mutant cytoplasm from *N. crassa*; progeny whose protoperithecial parent was aconidial *N. sitophila* showed a one to one segregation for the aconidial characteristic whereas progeny from the reciprocal cross were all conidial. When this latter progeny was back-crossed on to *N. sitophila* cytoplasm, half of the crosses segregated for the aconidial character.

It is thought that these results may best be explained on the basis of differential interaction between a particular nuclear gene and different cytoplasms.

1107 *Steiner, E. Some observations on incompatibility alleles of the complex-heterozygotes of* Oenothera. (*p. 274*).

"Earlier studies have demonstrated the presence of incompatibility alleles in the alpha complexes (those transmitted through the egg) of the *biennis* group 1 of *Oenothera*. Evidence of incompatibility alleles in the alpha complexes of races belonging to other phylogenetic groups can be obtained by producing hybrids combining these alpha complexes with the alpha *biennis* group 1 complexes. Self-incompatibility of such hybrids indicates the presence of incompatibility alleles. A survey currently in progress shows that the alpha complexes of at least four phylogenetic groups of complex-heterozygotes in addition to the *biennis* group 1 possess incompatibility alleles. In the race *Heber* results indicate that the *S* allele may have undergone mutation to an S_f or self-fertile form, at least in one plant. The data which are available at present support in general the assumption that each race carries a different *S* allele, although critical tests of the identity of alleles in the different races have not been completed. Preliminary tests with self-incompatible alpha·alpha hybrids whose chromosome numbers have been doubled indicate that the incompatibility reaction in the tetraploid is the same as in the diploid."

1108 *Steinitz-Sears, L. M. The structure of chromosomes in the female gametophyte of* Triticum vulgare. *(pp. 274–75).*

The embryo-sac mother cell and female gametophyte of wheat have been studied after Feulgen staining *in toto*, the stain squash method used being an adaptation of that of Darlington and LaCour. The antipodal cells were found to divide at least three times; after mitosis, a series of endomitotic divisions results in the production of bundles of chromosomes similar to the salivary chromosomes of *Drosphila* but there is no fusion of centromeric regions into a common chromocentre. Eventually the antipodal cells degenerate. The giant antipodal chromosomes are suitable for detailed studies of chromosome structure. Megasporogenesis was found to take place one week later than microsporogenesis in the same floret.

1109 *Stern, H. & Foster, T. S. Some intracellular factors governing DNA duplication in anthers of* Lilium longiflorum. *(p. 275).*

Chromosome duplication in its primary stages is said to be associated with a pronounced shift in certain elementary metabolic processes in the cell including those leading to the formation of low molecular weight deoxynucleosidic compounds; there is a relation between the accumulation of such soluble substances and the subsequent synthesis of DNA in the sporogenous cells. It is suggested that the break-down of tapetal cells furnishes DNA fragments which are used in later syntheses.

1110 *Stich, H. F. & Naylor, J. K. Variation of the DNA, RNA and protein content of specific chromosome regions during development. (p. 276).*

The results of quantitative cytochemical studies of the salivary gland chromosomes of *Glyptotendipes* showed that the DNA content at a few particular chromosomal regions is subject to variation; this variation occurs independently in different loci during development and probably reflects a functional pattern. Puffed regions of the chromosomes differ in their metabolism, producing substances of different chemical composition; these substances could be primary gene products.

1111 *Stinson, H. T. (Jun.). Genome-cytoplasmic interactions and species crosses in Oenothera. (p. 277).*

"The circle-forming behaviour of certain Oenothera strains makes it relatively easy to transfer the genome of one species into the cytoplasm of another. The procedure used was to cross a geographical race of the complex-heterozygous species *O. parviflora* as female by an alethal, complex-homozygous race of *O. hookeri*. The F_1 complex combination, alpha *parviflora* · ^{h}*hookeri*, gives ⊙ 14 at meiosis. On selfing, ^{h}*hookeri* · ^{h}*hookeri* segregates are obtained in *parviflora* cytoplasm, since *parviflora* was female parent in the original cross. The recovered *hookeri* plants are only slightly different from the original *hookeri* parent, probably owing to *parviflora* genes which entered one, or both, of the recovered *hookeri* complexes through crossing-over. The recovered and original *hookeri* are further alike in their breeding behaviour when used as male parents, but are markedly different when crossed as female parents by the same tester strains. *O. hookeri* crossed as female by *O. parviflora* and *O. argillicola* gives chlorotic F_1 plants which die as seedlings. In contrast, the recovered *hookeri* in *parviflora* cytoplasm gives fully green plants when crossed by the same parvifloras, and fully green and green-yellow variegated plants when crossed by the argillicolas. The variegated plants result probably from male transmission of *argillicola* plastids which are incompatible with the ^{h}*hookeri* · ^{h}*argillicola* genome. The recovery of ^{h}*argillicola* · ^{h}*argillicola* plants in *parviflora* cytoplasm is also possible by the method outlined above. When now the cross is made between *hookeri* and *argillicola*, both of which possess *parviflora* cytoplasm, all the progeny are fully green; no variegated plants occur. Thus, for the first time in the American Oenothera material it has been possible to get mature green plants with the genome combination ^{h}*hookeri* · ^{h}*argillicola*, by employing the cytoplasm (plastids) of a third species, *O. parviflora*. That the different breeding behaviour of the recovered *hookeri* is not due to the presence of alpha *parviflora* genes acquired through crossing-over in F_1 (alpha *parviflora* · ^{h}*hookeri*) is indicated by the fact that ^{h}*hookeri* · ^{h}*hookeri* plants isolated from the same F_1 in *hookeri* cytoplasm breed as the original *hookeri*."

1112 *Stroun, M. Hybridation végétative chez les plantes. (Vegetative hybridization in plants). (p. 280).*

Experiments with various plants showed that if a plant is grown parasitically on another plant during the F_1 period only, both the characters of the grafted plant and of its progeny are modified.

1113 *Stutz, H. C. Penetrance-dominance relationships of a new macromutation in rye. (p. 280).*

A mutant gene recently found in a strain of Turkish rye results in the production of several spikelets at each node of the spike; this factor behaves as a simple recessive gene in crosses with annual strains and as a dominant in crosses with perennial species of *Secale*.

Amongst segregating populations from hybrids between the mutant form and another strain of Turkish rye, mutant plants showed incomplete penetrance, in that only some of the spike nodes bore multiple spikelets. In the F_2 generation of a hybrid between the mutant and Merced, there was incomplete penetrance within and between culms and between plants, the mutant gene behaving as a subrecessive. In some cases only a single node on one spike of an entire plant showed the mutant phenotype. Incomplete penetrance was expressed within culms but not between culms or between plants in segregating populations of hybrids involving the mutant and perennial species.

It is concluded that the penetrance and therefore the dominance of this gene is less a property of the gene itself than of the external and internal environment. Since the different genetic backgrounds appear to be new genetic environments for this particular gene, the dominance properties are apparently independent of those selective forces which other workers such as Fisher, Haldane and Wright have suggested as the basis for the origin of dominance.

1114 *Sueoka, N. Studies on the genetics of tyrosinase in* Neurospora. *(p. 281).*

A strain of *N. crassa* from Singapore was found to have a new variant of tyrosinase differing from other standard forms in electrophoretic mobility and heat stability; the *T* locus determines these differences and is also responsible for the other structural forms of tyrosinase. In another strain, inability to produce tyrosinase and laccase is controlled by a locus designated *np* which is independent of the *T* locus. Heterocaryons of various combinations with respect to the different forms of tyrosinase and inability to produce the enzyme have been made. The heterocaryon (np, T^L) ($+$, T^S) produces a mixture of T^L (thermolabile) and T^S (thermostable) tyrosinases. These results suggest that the normal allele of the *np* locus has some function in enzyme formation differing from that of the *T* locus; the simultaneous blocking of laccase production supports this view. Other strains which do not produce tyrosinase are also being studied.

1115 *Suskind, S. R. The role of suppressor genes in controlling tryptophan synthetase activity in* Neurospora crassa. *(p. 284).*

"Yanofsky and Bonner have shown that specific suppressor genes are capable of partially restoring tryptophan synthetase activity in certain tryptophan-requiring (*td*) mutants of *Neurospora* lacking enzymatic activity. It was previously found that these suppressed mutant strains, which now form active enzyme, continue to synthesize an enzymatically inactive, antigenically related protein (CRM) characteristic of the unsuppressed mutant. Tryptophan synthetase has been prepared from inactive crude extracts of a temperature-sensitive *td* mutant (td_{24}) by fractionation and removal of an inorganic inhibitor. Such active preparations still contain considerable quantities of CRM in addition to the enzyme. The td_{24} enzyme exhibits high *in vitro* sensitivity to both the inhibitor and to zinc. Inhibitor and zinc sensitivity of partially purified enzyme preparations from the following strains have been compared: td_{24} td_{24} Su_{24} (td_{24} carrying a specific suppressor gene) and wild type. Enzyme prepared from the suppressed mutant appears to resemble that of the unsuppressed td_{24} mutant, and not wild type. These preliminary results suggest that a suppressor gene may have little to do with the actual formation of the enzyme, but rather, it may serve a regulatory function, controlling inhibitor, cofactor or inducer levels or the extent of *in vivo* enzyme-inhibitor and enzyme-coenzyme complex formation. Such an interpretation may be favored by the recent observation that a pyridoxin mutant of *Neurospora*, grown on limiting pyridoxin, forms a protein antigenically related to tryptophan synthetase. Little if any enzyme activity can be demonstrated in crude extracts tested in the presence or absence of pyridoxal phosphate. The quantity of the inactive protein approximates the level of enzyme found in the wild type.

Perhaps in coenzyme deficient cells, the apoenzyme, instead of combining with coenzyme, reacts with a normal cell component, forming an inactive complex."

1116 *Sveshnikova, I. [Svešnikova, I. N.]. The evolution of the nucleus in the genus* Vicia. (*p. 285*).

"The karyological method applied by us in the systematics of the genus *Vicia* has revealed certain laws governing the evolution of that genus. Within the limits of minor taxonomic units, more precise correlative connections between these units can be discovered by the comparative study of changes in their systematic symptoms and in the morphological peculiarities of their nuclei. Given the existence of characteristic laws governing the translocation of interspecific hybrids, these translocations become indicators of the evolution of the species, thereby differing from the translocation of X-ray mutants. The X-ray mutants with surplus chromosomes obtained by us are also of interest in solving the problem of the phylogenesis of the species, since they help to study the localization of definite features in the chromosomes. Polyploid forms have been found only in perennial forms of *Vicia* reproducing from the root stalks, which points to the somatic origin of polyploids in the genus *Vicia*."

1117 *Swaminathan, M. S. & Natarajan, A. T. Cytological and genetic changes induced by vegetable oils in* Triticum aestivum. (*pp. 285–86*).

Seeds of *T. aestivum* 'C591' were soaked for 24 hr. in mustard, groundnut and castor oils before planting in the field. The root meristems of the resulting plants showed certain mitotic abnormalities including chromosome and chromatid breaks at metaphase, spindle abnormalities and "error" bridges thought to arise from subchromatid breaks. Binucleate cells with synchronized and nonsynchronized mitoses were also observed. The presence of numerous fragments lasting over several mitotic cycles indicated that exchange or reunion is rare. However during metaphase I in microsporocytes one or two quadrivalents were noted in several plants indicating that delayed reunion can occur. Also indications of deficiencies and duplications were provided by the pachytene configurations observed.

Speltoid plants occurred both in the year of treatment and in subsequent generations; of the plants treated with groundnut oil, two short and stiff strawed plants occurred in the second generation and also a beardless form was found. This plant was selfed and crossed with the beardless C591. The progeny of the beardless plant included beardless, long-tipped, half-bearded and fully bearded plants. Fully bearded and long-tipped plants occurred in a ratio of 1 : 1 in the F_1 of C591 beardless x bearded. It is supposed that the original beardless plant was a chimera with the germinal layer which gives rise to the glumes being homozygous for a deletion of the awn-producing genes and the layers responsible for microsporocytes and megasporocytes being correspondingly heterozygous. The use of recessive symbols for awn-producing alleles appears to be incorrect.

1118 *Szende, K. An unusual mutation frequency to pentose utilization in a strain of* Ustilago maydis. (*p. 286*).

"When monosporidial glucose-grown cells are spread on d-xylose agar, most of the cells form colonies, but not in a homogeneous manner as the colonies become visible between the third and fifteenth days. In liquid d-xylose medium the growth begins after a long lag. When washed cells were inoculated in a liquid medium without carbon source, there was a residual growth with a 10^2 size. This residual growth is not limited on agar without carbon source. The cells of the colonies picked from xylose plates and respread on xylose plates again showed no lag heterogeneity, perhaps owing to the selection of non-utilizers of xylose. After several passages on glucose media this xylose utilizing property remained stable. This indicates a mutational origin. A mutation rate higher than 10^{-3} was observed, but the examination of exact values encountered some difficulties because of the large residual growth, the high mutation frequency, and the unlimited growth on agar plates. As the mutational frequency is unusually high, thus making it difficult to obtain conclusive evidence for the discontinuous genic change, we cannot, therefore, exclude the possibility of a heterogeneous activation or inhibition of the formation of the xylose-utilizing enzyme complex resulting in a continuous change of the phenotypic expression. In the preliminary experiments the xylose isomerase activity was demonstrated in xylose adapted cells. After passage on glucose the cells lost their enzyme activity. It is possible that following the mutational event the presence of the xylose as a specific inductor is also necessary for the expression of the potency for formation of the xylose-utilizing enzyme complex."

1119 *Tanaka, N. Cytological effect of radioactive rainfall.* (*pp. 287–88*).

The frequencies of chromosome aberration in mitotic cells of *Tradescantia paludosa* were noted for two sets of plants, one lot being kept under glass and the other in the open air. It seemed that the differences in frequencies of the chromosome aberrations were probably statistically significant and that the frequency increased linearly with the dosage of radioactivity.

1120 *Tavčar, A. Genetics and cytogenetics of maize with multiple number of leaves and ears on stalk knots and branches on tassel knots.* (*p. 290*).

In the F_2 generation of a cross between two normal maize plants, a single plant was found in 1927 with two leaves at each node of the stalk, ears on the central nodes of the stalk and branches at the tassel nodes. Selfing for many years has resulted in plants with 1, 2, 3, 4, or 6 leaves at each node of the stalk, ears on midstalk nodes and branches on tassel nodes. Other plants have the number of leaves per node varying according to the position of the node on the plant. The height of the plants and the length and breadth of the leaves decreases proportionally with an increase in the number of leaves per stalk node. Back crossing abnormal plants to normal showed that dominance occurs in the following order: 1 leaf per node (In) $>$ 2 leaves (In^d) $>$ 3 leaves (In^t) $>$ 4 leaves (In^q) $>$ 6 leaves (In^s), the genes responsible for these characters forming a multiple allelic series. The number of leaves on each stalk node, the number of ears on the midstalk nodes and the number of branches on each tassel node are correlated.

In the abnormal plants, the number and structure of the chromosomes differ from those of normal plants; the nearly homozygous abnormal plants have $n = 12–14$ chromosomes which form 11–12 bivalents and 3–2 univalents. Many meiotic aberrations were observed in the abnormal plants.

1121 *Therman, E. The ineffectiveness of indole-3-acetic acid on the meiosis of* Eremurus. (*p. 293*).

Treating inflorescences of *E. himalaicus* with indole-3-acetic acid produced no effect on meiosis.

1122 *Ting, Y. C. Inversions and other characteristics of teosinte chromosomes.* (*p. 295*).

The results of cytological studies of F_1 hybrids between three teosinte varieties and two selected maize inbreds are reported. The hybrids of Huixta, a variety of teosinte from Guatemala, showed no inversions; Huixta differs from other previously studied Guatemalan teosinte forms in having most of its knobs situated internally. Of the 585 microsporocytes examined, 12·3% had two univalents and 0·8% had four univalents at diacinesis.

The hybrids of maize and Durango, a teosinte from Mexico, were heterozygous for two almost terminal inversions on the short arms of chromosomes 8 and 9, the inversions involving 59% and 56% respectively of the short arms of these chromosomes. Dicentric bridges and acentric fragments were found at anaphase 1 and anaphase 2. Of 514 cells examined at diacinesis, 0·8% had two univalents; more than two univalents were not observed. In the Durango teosinte, two hitherto unreported knob positions were found, one on the large arm of chromosome 8 and the other on the long arm of chromosome 9.

The hybrids involving Nobogame, another teosinte from Mexico, were heterozygous for three inversions; two were almost terminal and situated on the short arms of chromosomes 8 and 9, the inversions representing 62% and 59% respectively of these arms. A third paracentric inversion was found on the long arm of chromosome 5, the length of the inverted segment being about one half of the long arm of this chromosome. At anaphase I and anaphase II, dicentric bridges and acentric fragments were observed. At diacinesis 514 cells were studied; 11·8% had two univalents and 0·4% had four univalents. The Nobogame chromosomes have few knobs: a large terminal one on the short arm of chromosome 7 and smaller knobs on chromosomes 1, 2, 4 and 6.

1123 *Tsuda, S. Some features of fine structure of hyphal cells of wild type of* Neurospora crassa, *as observed with the phase and electron microscope.* (*pp. 297–98*).

Nuclei of *N. crassa* were found to have a diameter of 1·5 to 2 microns; the nuclei are surrounded by inner and outer membranes with pores. Nuclei move from one cell to another through central pores in the transverse cell walls; each cell has about six nuclei.

1124 *Wagner, R. P. & Bergquist, A. The accumulation of probable isoleucine and valine precursors by a mutant of* Neurospora. (*pp. 303–04*).

A mutant of *N. crassa*, T304, which will only grow in the presence of both isoleucine and valine, accumulates acetylethylcarbinol and acetylmethylcarbinol in its growth medium; these substances can be derived from α-acetoα-hydroxybutyric acid and α-acetolactic acid respectively. The former acid is thought to be the precursor of isoleucine and the latter the precursor of valine.

A single gene appears to be responsible for the mutant condition of T304; "it is linked to 16117 which is also an isoleucine-valine mutant."

1125 *Wakonig, R. & Arnason, J. T. Effects of triazine on chromosomes. (p. 305).*

Roots of *Vicia faba* treated for 12 hr. in a 10^{-5} M solution of 2 : 4 : 6 tri(ethyleneimino)-1 : 3 : 5-triazine at 20° C. showed few chromosome aberrations until about 12 hr. after the treatment had ended; anaphase aberrations showed a peak frequency at about 24 hr. after treatment, nearly 30% of the cells being then affected. Reducing the duration of treatment or the strength of the solution lowered the frequency of anaphase aberrations. Observations on metaphase chromosomes were made on material prefixed in 0·05% colchicine solution for 2 hr. Many aberrations were again noticed in roots collected 24 hr. after treatment; free fragments, paired constrictions and chromatid interchanges as indicated by triradial and quadriradial configurations were found. Dicentric chromosomes were not seen. A few interchanges involving the satellite chromosome were observed. Sister reunions were more common in acentric than in centric fragments. Most of the breaks and exchanges occurred in heterochromatic regions of the chromosomes; the regions on either side of the centromere were most frequently involved in breaks and exchanges in the satellite chromosome. Chromatid interchanges did not usually involve exchanges at homologous loci.

A 24 hr. treatment with 10^{-3} M triazine completely inhibited the germination of barley seed; in hexaploid wheat about 50% of the seedlings were inhibited. The surviving wheat seedlings are to be used in mutation studies.

1126 *Walker, G. W. R. & Miller, R. A. Linkage and cytological studies of barley mutants. (pp. 305–06).*

"A number of mutants in commercial barleys have been investigated to determine the linkage groups involved. Ten of these mutants were produced at the University of Saskatchewan, two at the University of Alberta, and seven were from other sources. These mutants show linkage to known markers (*v*, *b*, *trd*, *n*, *br*, *r*, *s*, *an*). The following genes have been shown to be allelic: 'bracteatum' and 'third outer glume,' and two glossy-leaf mutations in irradiated Montcalm and chemically treated Gateway. 'Peto's mutant' carries the 'orange lemma' gene, and two 'bushy' mutants in irradiated Montcalm carry the 'elongated outer glume' gene. A highly significant difference in linkage group VI has been found between populations from the 'intermedium' side-florets and central florets of the F_1 of a cross between a glossy-leaf mutant and Nigrinudum I. Translocations have been cytologically identified in the F_1's and F_2's of the testers Nigrinudum I and Brachytic 119 with 'longawned outer glume 3' and 'early 6' (54/1121 r65 and 54/1121 r95, Gustafsson), 'sterile misshapen heads' and 'chlorotic stripe' (L50–305 and L50–321, Lambert) and a 'dense head' mutant (L5220, obtained from Dr. E. Larter, University of Saskatchewan)."

1127 *Wang, C.-W. & Perry, T. O. The ecotypic variation of dormancy, chilling requirement, and photoperiod response in* Betula *species. (p. 307).*

Birches of different geographic origin growing under uniform conditions were found to show marked variation in the times when growth was initiated and when height growth ceased.

In order to study ecotypic variation, a collection of *B. papyrifera* and *B. alleghaniensis* raised from seed collected in Canada, Alaska and the USA was treated with various combinations of winter chilling and photoperiod. Photoperiod was found to control the continuation of shoot elongation and the onset of dormancy as shown by the terminal bud formation. Initiation of growth did not appear to be influenced by photoperiod except in some unchilled plants, where the breaking of dormancy seemed to be hastened by an exposure to a long photoperiod. Winter chilling of 38–40° F. resulted in a normal breaking of dormancy in spring for most of the plants. But under Florida conditions the birches of extreme northern origin broke their dormancy without winter chilling; most of the other unchilled plants also ceased to be dormant after various periods of delay. These plants mostly produced leaves on the basal branches, the terminal bud remaining dormant for periods of a few months to a year. "Observations of the winter chilled plants showed that with the exception of high altitude plants, the time of the breaking of dormancy and the time of the onset of dormancy were inversely correlated to the latitude of origin."

1128 *Warburton, F. E. Natural selection as the accumulation of information from the environment. (p. 308).*

"Shannon's mathematical theory of communication allows us to treat the gene complement of an organism as a 'message.' The information conveyed by the message to its recipient—in this case, to the developing organism—is (in binary digits):

$$H=\log_2 \frac{\text{probability of certain events after receipt of message}}{\text{probability of same events if message were not received}}.$$

"In evolution the information content of genomes has tended to increase. Mutation and drift can be shown to lead to loss of genetic information. The large information content of genomes must therefore have been accumulated by natural selection. The rate of accumulation, in binary digits/locus/generation could be calculated for a given population if mutation rates and variations in gene frequencies from generation to generation were known with sufficient accuracy; such calculations may be feasible within a decade.

"By natural selection, the environment determines which genotypes will be transmitted to future generations; i.e., the original source of genetic information is the environment. Natural selection can therefore be considered as a mechanism by which populations accumulate information from their environments."

1129 *Watanabe, T. & Watanabe, M. Transduction of streptomycin resistance in* Salmonella typhimurium. (*pp. 308–09*).

Both streptomycin indifference (one-step complete resistance) and resistance in the narrow sense (multiple-step resistance) have been transduced using *Salmonella typhimurium* strain LT2 and temperate phage P22.

"Transduction of indifference was found to require one to three generations for phenotypic expression. This lag may involve a segregation delay if the indifference locus is recessive in this strain. Phenomic lag is also assumed to play a role because transduction of indifference is phenotypically expressed gradually from partial to complete resistance, despite the fact that there is much evidence for the control of indifference by a single gene.

"Transduction of intermediate resistance into sensitive bacteria does not give clear-cut positive results. The reason for this is unknown at present. The fact, however, that the second step of resistance may be transduced into one-step resistant bacteria suggests that the difficulty is merely technical. Furthermore, the substitution by transduction of the wild-type allele at the resistance locus was found to occur very easily with the following technique. Because resistant mutants are slow growers, it is easy to detect the fast-growing transductants on the poor background growth of the resistant recipient on agar plates without streptomycin. In transductions with one-step intermediate resistant mutants as recipients, the fast-growing transductants were found to be streptomycin sensitive. With this technique, it has become possible to cross resistance with sensitivity, resistance, and indifference. A number of independently isolated one-step and two-step resistant mutants have been analysed and many loci which control streptomycin resistance have been found. Linkage of streptomycin loci to other markers is also under study."

1130 *Weijer, J. Evidence for a complex structure of the* td-*locus in* Neurospora crassa. (*p. 310*).

Several spontaneous *td*-mutants and one *td* mutant induced by ultraviolet radiation at a low energy level were found to be characterized by a tryptophane requirement which could not be satisfied by indole; heterocaryons between these strains could only be formed in the presence of tryptophane. In six intramutant crosses using "fluffy" as a marker in one of the parental strains, tryptophane-independent isolates were recovered from combinations involving the mutants *td*–UA2, *td*–UA5 and *td*–UA6; these strains did not produce tryptophane-independent recombinants on selfing. The results are thought to indicate that several closely linked genes occur within the *td* locus and that all these must be present in the same linkage group for expression of the *td* locus in tryptophane formation.

1131 *Welsh, J. N. & Green, G. J. Genes in oats for resistance to stem rust races and the genetics of host reaction.* (*p. 311*).

Fifteen races of *Puccinia graminis* f. sp. *avenae* have been identified on the North American continent; resistance of the host species is governed by four major genes *ABDE* and probably a fifth gene *C*. Gene *A*, carried by the variety Richland and some other varieties, governs resistance to races 1, 2, 3, 5, 7, 7A and 12. The resistance of Hajira and its derivatives to the two groups of races 1, 2, 3, 5, 7 and 12 and 4, 6, 8, 10, 11 and 13 is thought to be controlled by either two closely linked genes, *B* and *C*, respectively or by the *B* gene alone. Gene *D*, possessed by White Russian and its derivatives, is responsible for resistance to races 1, 2, 5, 8, 8A, 10 and 11; gene *E* occurring in Jostrain and its derivatives confers resistance to races 1, 3, 4 and 11 and partial resistance to races 5, 10, 12, 13 and 13A. The races 8A and

13A were isolated for the first time in Canada in 1957.

A study of several crosses confirmed the existence of the genes *A*, *B*, *D* and *E* but the existence of *C* is doubtful.

1132 *Wettstein, D. H. von. Directed mutability and submicroscopic gene physiology in chlorophyll lethals.* (*p. 312*).

The use of chlorophyll lethals in studying the action of different mutagens and in analysing the genetic control of plastid development in self-fertilizing plants, such as barley, is described. In the lethals investigated with the aid of electron-microscopic techniques, the synthesis of the lamellar structure in the chloroplasts is blocked in various stages, there being very little effect on the plastid growth as a whole. Certain genes are said to control the formation of extended submicroscopic units from smaller units. Plastids appear to be particularly useful for studying the action of genes on structural organization at a macromolecular level.

1133 *Whitehouse, H. L. K. Patterns of interference between cross-overs in* Neurospora. (*pp. 312–13*).

Analysis of asci segregating at four loosely linked loci, mating type, *me* (35809), *al*–2 and *nic*–1, in the mating type chromosome of *Neurospora crassa* is in progress. Preliminary results indicate negative position interference across the centromere and an excess of two-strand relationships. Whilst some investigations have had similar results others have found no position or chromatid interference. Strains of *Neurospora* therefore appear to be heterogeneous in their patterns of interference across the centromere. In the proximal part of the right arm of the mating type chromosome there appears to be positive position interference and an excess of four-strand relationships. There also appears to be positive position interference in the distal part of the right arm but no chromatid interference.

The diversity in patterns of interference is tentatively explained in an extension of Pritchard's hypothesis [cf. XXVI, 1951]. It is postulated "that within regions of effective pairing only two-strand relationships occur between cross-overs, while between one such region and another, other strand-relationships are possible, perhaps as a consequence of delayed duplication of chromatids in the intervening regions. In some strains of *Neurospora*, one of the regions of effective pairing is presumed often to include the centromere."

1134 *Williams, L. F. Alteration of dominance and apparent change in direction of gene action by a mutation at another locus affecting the pigmentation of the seedcoat of the soybean.* (*pp. 315–16*).

"Major pigmentation patterns of the seedcoat of the soybean are controlled by a series of alleles at the *I* locus. On a *TR* background (tawny pubescence, black pigment), the effects of these alleles, arranged in decreasing order of dominance, are as follows: *I*, pale slate hilum, coat yellow or green; i^1, black hilum, seedcoat yellow or green; i^k, hilum and saddle black, remainder brown; *i* self black. Ordinarily, dominance is complete.

"In two mutants from i^1 types, the hilum and saddle are black with the remainder yellow or green. This is a result of a recessive mutation at the *K* locus, the effect of *k* being to increase pigmentation. However, the other three *I* alleles, which have very distinct effects on a *K* background, have identical phenotypes in combination with *k*. The homozygous types are all self black and the i^1 heterozygotes have an extended saddle closer to self black.

"The *I* allele is affected most. In combination with *K*, *I* seems to have a strong inhibitory effect, but with *k* it seems to have an enhancing effect. This change in dominance and in type of allele action is difficult to explain. A suggested explanation is that *I* rather than inhibiting pigment, merely has a very weak enhancing effect and *k* is thus able to affect pigmentation."

1135 *Williams, W. The manifold effects of major genes in relation to economic characters in plants.* (*p. 316*).

Studies on the genetic control of flower number in tomato genotypes homozygous for the suppressed lateral gene *ls* are described. "The analysis of F_2 families segregating for recessive marker genes showed that when the marker was present in the homozygous recessive condition the effect of *ls* in reducing flower number was intensified. The most pronounced effect was produced by interaction between *ls* and *dm* (linkage group IX) and *ls* and *l* (linkage group VI). The only interactions which effected an increase in flower number above *ls ls* + + were *ls ls a a* (linkage V) and *ls ls y y* (linkage group III). None of the ten markers proved completely neutral in respect of flower number when combined with *ls*. When scored singly the major gene markers differed insignificantly from the dominant wild type except in the genotypes *wt wt* and *b b* where a significant increase over the wild type was demonstrated." Data concerning four loci in *Prunus persica* and *P. avium* have also been completed.

1136 *Williams, W. & Dowrick, G. J. The induction of mutations in plants using radio-active phosphorus* (P^{32}). (*pp. 316–17*).

[Cf. XXVIII, 3697 and 3793 and XXIX, 37].

1137 *Wilson, G. B., Sparrow, A. H. & Pond, V. Radiation-induced sub-chromatid breakage and rejoining during meiosis of* Trillium erectum *L.* (*pp. 317–18*).

Anthers of *T. erectum* were X irradiated at a dose rate of 25 r. at various stages of meiotic prophase and at the first metaphase. Post-pachytene treatment produced 2-side-arm bridges indicating half-chromatid exchanges; prediplotene treatment did not produce such configurations. The four associated half chromatids of a half bivalent are thought to be the most likely targets for primary effects of irradiation. The results indicate that the half bivalent becomes effectively quadripartite during postpachytene stages. It also appears that only two of the four half chromatids are broken by a single ionization track. Exchanges between these two half chromatids produce two types of 2-side-arm bridges. Whether a 2-side-arm bridge appears at the first or second anaphase depends on the position and number of chiasmata between the point of breakage and the cinetochore. No 2-side-arm bridges have been detected at microspore anaphase after meiotic prophase irradiation. The configurations expected to occur at microspore metaphase as a result of the breaking of 2-side-arm bridges have only rarely been found.

1138 *Wolff, S. Protein synthesis and chromosome break rejoining.* (*p. 319*).

When soaked seeds of *Vicia faba* are treated with fractionated doses of X rays, the frequency of induced chromosome exchanges varies according to the fractionation time. If the breaks produced by the first dose have not rejoined before the second dose is applied, the aberrations yield is the same as for a non-fractionated dose, i.e. the yield is proportional to the square of the total dose. If the first set of breaks have completely rejoined before the second treatment is received, the yield of aberrations is the sum of the yields of the partial doses. Cellular metabolism and the production of ATP are necessary for the rejoining of breaks; the breaks are of covalent bonds. In another experiment the seeds were treated with 300 μg./ml. of chloramphenicol to inhibit protein synthesis immediately after the first irradiation. The breaks then remained open for at least 75 min. as determined by the aberration yield when a second irradiation took place 75 min. after the first; without the chloramphenicol treatment the first breaks would rejoin in 30 min. These results suggest that protein synthesis is necessary for the rejoining of radiation-induced chromosome breaks. It is not known whether the bonds synthesized during rejoining are peptide bonds or whether protein synthesis is concerned in the repair of damage to a postulated "rejoining system."

1139 *Woods, P. S. & Taylor, J. H. Nucleic acid synthesis in dividing cells.* (*pp. 320–21*).

The metabolism of RNA and DNA in dividing cells of *Vicia faba* seedlings was studied by means of autoradiograph tracer techniques using tritium-labelled cytidine, a precursor of RNA and DNA.

The incorporation of the labelled precursor took place first in the nucleolus and later in the cytoplasm. Radioactivity in the chromatin was variable; it was largely due to incorporation into DNA, whereas radioactivity in other parts of the cell was due to incorporation into RNA. It was also found that the nucleolus is either the only site of RNA synthesis in the cell, or is concerned with accumulating RNA that has been synthesized elsewhere, the synthesis time being very short; RNA is then transferred to the cytoplasm. DNA and RNA syntheses are independent processes.

1140 *Woodward, D. O. Heterocaryon complementation between adenylosuccinaseless mutants of* Neurospora crassa. (*p. 321*).

Thirty-five adenine-requiring mutants of *N. crassa* were tested for heterocaryon complementation in all possible combinations, the locus concerned being *ad*–4; 14 of the mutants gave at least one positive response, partial restoration of adenylosuccinase activity having occurred in all the cases tested. The *ad*–4 alleles were arranged in a linear sequence based on the complementation pattern, this being possible on account "of apparent overlap between non-functional regions characteristic of the individual alleles". Meiotic recombination occurred between some of the alleles giving rise to wild-type progeny; the alleles involved appeared to be the more widely separated ones of the linear sequence. The order of the alleles deduced from crosses involving linked markers on either side of the locus did not conflict with the order based on the heterocaryon tests. Certain crosses were infertile so a complete recombinational analysis was not possible. Some of the heterocaryons were sensitive to temperature; they showed wild-type growth at 25° C. Some indication was found of a specific region or regions within the locus affecting temperature sensitivity.

1141 *Woodward, V. W., Suyama, Y. & Munkres, K. D. New loci affecting pyrimidine metabolism in* Neurospora. (*pp. 321–22*).

Amongst 100 pyrimidine-requiring mutants of *N. crassa* recently isolated at Kansas State College, at least two were found to differ genetically and physiologically from any mutants hitherto reported.

Equivocal evidence for the existence of a fifth locus involved in pyrimidine synthesis had previously been found. "It is now evident that the earlier implication was based on the phenotype of a double mutant, KS–12. Mutant KS–12 is physiologically similar to pyr–3 (37301), but is genetically dissimilar. On crossing, it gives rise to two distinctly different mutants, one of which is designated as pyr–5, and the other, laggard (lg), a pseudoallele to pyr–1 (263). In a cross between KS–12 and KS–43 (a pseudoallele of pyr–3), from one ascus, ascospore pair 3–4 was lg. Mutant lg is physiologically similar and pseudoallelic to pyr–1 (showing 0·53% wild-types). Pyr–1 and lg grow slightly in minimal medium and are stimulated by uridine, uracil, dihydrouracil and orotic acid; pyr–1 responds to β-ureidopropionic acid, but lg does not. From the same ascus (KS–12 x KS–43), ascospore pair 7–8, when crossed to wild-type, gave rise to pyr–5. Pyr–5 is physiologically similar to lg except that it does not grow at all in minimal medium; it responds to the same but not to different, metabolites. Mutant pyr–5 appears to be located distal to pyr–3. Its physiological requirements lead us to conclude that its mutant effects involve the reaction β-UPA ←→ DHU in the uracil reductive pathway. Mutants involving metabolic interruptions of several steps in the reductive pathway of uracil metabolism as well as the pathway of orotic acid biosynthesis have been studied."

1142 *Wylie, A. P. & Davies, A. J. S. Giant chromosomes and amitosis in the endosperm of* Lathyrus. (*pp. 323–24*).

It was found that the nuclei in the chalazal region of the endosperm of *Lathyrus* normally undergo endomitotic growth, attaining high levels of ploidy. The polyploid nuclei can divide by normal mitosis or by an amitotic process in which the chromosomes are distributed almost equally between two daughter nuclei. These daughter nuclei can also undergo normal mitosis; they have varying chromosome numbers and small acentric rod and ring chromosome fragments. Micronuclei are common in regions of the endosperm where amitosis has occurred.

Giant polytene chromosomes arise in the chalazal nuclei from about 14 days after fertilization onwards. Nuclei containing such chromosomes can undergo amitosis but not normal mitosis. Species vary in the regularity with which giant chromosomes occur; this probably depends on the heterochromatin content.

Similar phenomena have been observed in other members of the Papilionaceae.

In some interspecific crosses of *Lathyrus*, the embryos abort before reaching maturity; this may be due to abnormalities in the embryo or endosperm.

1143 *Yamasaki, Y. & Kikuchi, M. Embryo transplanting as a method of genetico-physiological study in cereals.* (*pp. 325–26*).

For many years transplanting experiments with cereal embryos have been carried out at the National Institute of Agricultural Sciences, Hiratsuka, Kanagawa, Japan. A new technique has been in use since 1951, in which an immature embryo is transplanted into an immature endosperm in order to study the influence of the endosperm on the expression of the characteristics of the transplanted embryo.

It has been found that the endosperm of non-dormant or after-ripened seeds is able to promote germination in the embryo of dormant seeds or seeds in an intermediate state with respect to dormancy but endosperm from dormant seeds does not always inhibit the germination of the embryo of nondormant, after–ripened or intermediate seeds. It is suggested that the embryo and endosperm of dormant seeds contain a large amount of germination-inhibiting substances and little or no germination-promoting substances, the reverse condition being found in the nondormant seeds. Intermediate seeds are supposed to have the two kinds of substance in various ratios according to the degree of dormancy. Low temperature, oxygen and after-ripening can change the inhibiting substances into promoting substances.

When the embryo of a winter variety is transplanted on to the endosperm of a spring variety, the flowering behaviour of the embryo of the winter variety is not affected; similar results are obtained in the reverse transplantation.

When an excised embryo of a winter variety was given temperature treatment before being transplanted, the resulting plant did not ear but when the treatment was applied after transplanting, an ear was produced, even when the endosperm was of a variety, species or genus differing from that of the transplanted embryo. It is thought that a supply of substances, probably of a carbohydrate nature, from the endosperm is necessary for flower formation in an embryo of a winter variety during low-temperature treatment.

1144 *Yamashita, K. & Willweber, E. Studies on X-ray induced mutations in Einkorn wheats. (p. 326).*

A number of morphological and physiological mutations were obtained after dormant seeds of *Triticum aegilopoides* and *T. monococcum* were treated with X rays; the material has been investigated cytologically and genetically.

1145 *Yarnell, S. H. Penetrance and expressivity of six characters of cabbage. (pp. 326–27).*

The character terminal notch is only found on one or a few leaves per plant. The maximum percentage of plants with this character in inbreds studied at the Southeastern Vegetable Breeding Laboratory, Charleston, SC, varied from 2·7 in 1955 to 20·5 in 1950. Four commercial varieties produced between 1·8 and 3·7% notch plants, whilst selected notch plants from two varieties produced 3·7 and 4·5%. Selection increases the proportion of notch plants produced but penetrance and expressivity are low. *Heterophyllus*, a very irregularly shaped leaf, frequently occurs in populations segregating for terminal notch; the maximum percentage of this character ranged from 7·5 in 1957 to 34·9 in 1958. *Heterophyllus* is restricted in penetrance and expressivity but to a lesser extent than terminal notch.

Pseudowhiptail is a late developing character resembling in some ways the whiptail of cauliflower; the inner leaves become misshapen and coarsely serrated and the plant becomes lopsided. The maximum percentage of this character varied from 17·5 in 1954 to 88·1 in 1951. Pseudowhiptail families also produce poorkin, a small semilethal; in poorkin plants the leaves are thick, often long and sometimes curled. The maximum percentage of poorkin plants ranged from 19·3 in 1953 to 73·4 in 1957. Two other characters studied are balloon rosette and flat rosette; maximum percentage of the former in inbreds ranged from 1·3 (1954) to 96·4 (1952) and of the latter from 5·0 (1952) to 94·8 (1957). Environmental conditions can affect the proportions of these six types each season but the expressivity is unaffected. It is stated that "replicates grown in different years remain essentially unchanged when proportions are less than 10%. For larger amounts the proportion of *Heterophyllus* decreases with age of seed, and Pseudowhiptail and Poorkin increase. Balloon Rosette and Flat Rosette remain about the same or decline slightly to extensively in subsequent plantings. While selection does not always have the expected effect, the largest proportions of any type usually result from selection."

1146 *Yuasa, A. & Fujii, K. The organization of the nuclear material in* Spirillum sp. *(pp. 328–29).*

Young spirilla showed a zigzag or spiral structure within the cells when cultured on a peptone medium containing calcium lactate but not in the same medium without the lactate. Aged cells showed these structures independent of the medium used. The zigzag or spiral structure gave a positive reaction to the nuclear stains, Giemsa and gentian violet. The nuclear material in young cells is in a granular state showing some relation to volutin or metachromatic granules; later the nuclear material aggregates into longitudinal rods.

During cell division the nuclear material is divided transversely; cell division and the division of nuclear material are not always synchronized.

1147 *Yura, T. Genetic alteration of pyrroline-5-carboxylate reductase in* Neurospora. *(p. 329).*

A comparative study was carried out with the pyrroline-5-carboxylate reductase from a mutant of *N. crassa*, genetically blocked with respect to the terminal step in proline synthesis, and the corresponding enzymes from wild-type strains. It was found that the reductase of the mutant strains had an activation energy three to four times greater than that of the wild-type strains; also the reductase of the mutant was more labile, the activation energy for heat inactivation being several times greater with wild-type strains. These differences appear to be associated with the characteristics of the proline locus, *prol*–1. The reductase preparations from the mutant and wild-type strains were similar in many other properties. These findings are discussed in relation to the problem of gene action.

1148 *Zalokar, M. Primary gene product: protein or RNA?* (*p. 330*).

A technique has been developed for the centrifugation of living hyphae of *N. crassa*; by means of this procedure it is possible to separate microsomes, mitochondria and nuclei. Experiments are described in which mycelia were fed with radioactive aminoacids or nucleotides before centrifugation, after which autoradiographs were made. From the results it is tentatively concluded that the proteins are formed mainly in the microsomes while RNA appears first in the nuclei and then migrates into the microsomes.

1149 *Zarubailo, T. Y.* [*Zarubajlo, T. Ja.*]. *Transforming spring strains of soft wheat* (Triticum aestivum *L.*) *into winter strains by means of pre-winter sowing.* (*pp. 330–31*).

In experiments carried out in Puškin near Leningrad, seed from pure lines of spring wheat was sown annually for a number of generations in early October, control sowings being made in the spring. Eight of the 30 strains used proved to be unsuitable but the remaining 22, which were tested for 7–9 generations, yielded winter strains. In some of these strains, morphological changes were observed. The controls preserved their homogeneity in morphological characteristics and in the length of their vegetative period.

In the first three or four generations of the experimental plants, no marked increase in frost resistance was noted but in the fourth or fifth generation the increase in hardiness was considerable.

Winter-wheat characteristics were only weakly expressed in the frost resistant strains. When these plants were sown in the spring, they either formed ears without any vernalization at all, earing being slightly delayed as compared with that of the control plants, or they needed a short period of vernalization before sowing. These strains only required a long period of vernalization when sown in early September, a date approaching that of the normal sowing of winter wheat in Puškin.

Winter strains obtained from spring wheats differed from the initial varieties in their increased capacity for accumulating soluble carbohydrates in the cell sap during autumn, the quantities being comparable to those found in normal winter varieties. Sowing before winter must therefore bring about changes in the biochemical process in the cell; these modifications are thought to form the basis of hereditary changes which lead to the development of winter strains from spring wheats.

The ears of one of the experimental strains were isolated in cellophane containers in all the generations studied. A high degree of frost resistance was attained in the fourth generation of the autumn-sown plants. When sown in spring, these seeds yielded 22% winter plants and 30% of plants of a semiwinter type. These results showed that the derivation of winter strains from spring strains was not merely due to accidental hybridization between the controls and winter varieties.

1150 *Zelle, M. R. Studies of a large cell, radiation resistant, possibly polyploid strain derived from* Escherichia coli. (*pp. 331–32*).

A stable large-celled strain P6 was isolated following treatment of *E. coli* '82/r', derived from B/r, with camphor vapour. Certain characters of P6 indicate that it is a polyploid. P6 has approximately three times the dry weight, DNA content and RNA content per cell of the parent strain. Also it appears to have 1·5 times as many nuclei per cell as 82/r; this indicates that P6 is diploid, assuming that DNA is exclusively nuclear. P6 is much more resistant to high energy radiations than 82/r; the latter yields typical exponential survival curves whereas P6 has sigmoidal inactivation curves. The inactivation cinetics of P6 are compatible with either an increased nuclear number or an increase in ploidy.

P6 and 82/r have similar induced mutation systems, supposed to involve mutation from dominant to recessive alleles. Also the large-cell character segregates like any other unselected character in genetic crosses. The large-cell segregants are resistant to radiation, having sigmoidal survival curves like those of P6. Genetic tests to detect heterozygous genotypes have not yet given definite results but they indicate that P6 is not a polyploid. It is suggested that P6 has undergone a mutation which increases cell size, radiation resistance and nuclear number, this conclusion being supported by evidence that the large-cell mutation arises spontaneously and at increasing rates after increasing exposures to ultraviolet radiation.

1151 *Zhebrak* [*Žebrak*], *A. R. Polyploidy in wheat.* (*p. 332*).

T. monococcum and *T. timopheevi* are isolated from other species of *Triticum*. Hybrids were made between these two and various other species, the chromosome numbers of the hybrids being doubled by colchicine treatment. Sterile hybrids such as *T. durum* x *T. timopheevi* and *T. polonicum* x *T. timopheevi* become fertile when their chromosome number is doubled. The hybrid *T. durum* x *T. timopheevi* ($2n = 28$) is normally fertile; doubling the chromosome number decreases the fertility by 16 times.

The autopolyploids of *T. durum* ($2n = 56$) and *T. timopheevi* ($2n = 56$) have low fertility, producing only 4–5 grains per ear. Crossing these autopolyploids increases the fertility, as many as 30 grains per ear being produced in the hybrids. Amphidiploids produced by crossing *T. timopheevi* with other 28-chromosome species do not segregate into the initial species. They have a low variability which is increased when the hybrid is crossed with a third species, this being particularly marked in the case of *T. turgidum* x *T. timopheevi* ($2n = 56$) x *T. vulgare* ($2n = 42$). The hybrids have 49 chromosomes; amongst their progeny, primitive types, forms corresponding to *T. compactum* and others that surpass cultivated wheats in productivity and resistance to disease have been isolated.

Sesquidiploids were formed by crossing the amphidiploid *T. vulgare* x *T. timopheevi* ($2n = 70$) with *T. vulgare*; their progeny have new combinations of characters that can be regarded as new forms of species.

1152 *Zielinski, Q. Spontaneous tetraploidy in pears,* Pyrus communis *Linn.* (*p. 332*).

Twelve new spontaneous tetraploids of *P. communis* have been found in Oregon.

1153 *Dodson, E. O. & Yu, C. K. Centrifugal force as a mutagenic agent: preliminary report.* (*p. 333*).

The effects of centrifugal force on barley chromosomes alone and in combination with phenol are being studied at the University of Ottawa. Forces of less than 2000 g did not produce detectable effects. Centrifugation of seeds for 60 hr. at 2000 g resulted in moderate chromatin clumping and segmentation of prophase chromosomes, as observed in root-tip cells; germination was 90%. Centrifugation at 2000 g for 20 hr. produced similar effects but germination was reduced to 75%. More marked clumping, extensive segmentation of chromosomes and some amitosis were observed after centrifugation at 25000 g for 6 hr.; germination was reduced to 30%.

1154 *Gloushtshenko [Gluščenko], I. E. Some regularities of vegetative hybridization of plants.* (*pp. 334–35*).

Research workers in the USSR and elsewhere claim that, by means of grafting, hybrids can be obtained which are similar to those produced by sexual hybridization. Vegetative hybrids do however differ from sexual hybrids in certain ways. The heterosis of vegetative hybrids is transmitted to subsequent generations. Also the behaviour of dominant and recessive characters is different; for example plants with recessive characters often produce offspring with dominant characters. Mosaic forms with heterogeneous cells and tissues are more frequent among vegetative hybrids than among sexual hybrids. Interspecific graftings usually result in changed characters, when the grafting is repeated in subsequent generations. A wide range of variation is found in the offspring exceeding that found in the original parent forms. The new forms obtained do not usually produce further variations in subsequent generations.

1155 *Lubimova, V. F. On the origin and inheritance of certain new characters in wheat-couchgrass hybrids.* (*p. 334*).

At the Main Botanical Garden of the Academy of Sciences of the USSR, Moscow, hybridization between wheat and couchgrass produced plants in which the stamens were partly transformed into pistils (stamen-pistils). In other cases flowers developed with three normal stamens and two or three additional pistils; seeds were formed in the additional pistils after fertilization. Some of these pistils had two or three ovules instead of one; double embryo sacs giving rise to twins also occurred. When plants with multiple-pistil flowers were crossed with ordinary plants, many of the offspring had stamen-pistils instead of stamens; the progenies also produced multiple pistil flowers and some forms showed a tendency towards polyembryony. The forming of multiple-pistil flowers is transmitted as a recessive character. Such a character may be fixed by selection. The new characters found in these hybrids are more fully expressed when there is an abundant supply of nutrients, a short day and a moderate temperature during the early stages of development.

1156 *Polyakov [Poljakov], I. M. Experimental study of fertilization selectivity in plants and some problems of general genetics.* (*pp. 335–36*).

Experimental studies carried out in the USSR on species of *Nicotiana* "make it possible to differentiate the selectivity which is observed in the progamic phase of the fertilization process, and in the phase of genesis. A number of processes taking place in the progamic phase are also experimentally differentiated. They include: (*a*) the interaction of the pollen with the tissues of the pistil which take a different form in the various parts of the pistil; (*b*) the interaction between the components of the pollen mixture, taking place in the tissues of the pistil."

The incompatibility of certain intraspecific and interspecific crosses represents a more extreme case of fertilization selectivity. Experimental data indicate that selective fertilization does not result from the unequal competitive capacity of the pollen tubes.

"In conformity with certain internal and external factors, certain laws governing the processes of selectivity in fertilization can be established: (*a*) dependence of the direction taken by selectivity in fertilization on the quantitative relations of the various components present in the mixture of pollen and their proportions; (*b*) dependence of the selectivity of fertilization on the age factor; (*c*) dependence of the selectivity in fertilization on the alimentation conditions of plants, etc. The knowledge of laws governing selectivity in fertilization opens up a possibility for using them in plant-breeding practice.

"The general trend of selectivity processes in fertilization expresses the principle of historic affinity in sexual reproduction. Certain stages of intraspecific and interspecific differentiation are reflected to a greater or lesser degree in the selectivity of fertilization. In self- and cross-pollinated plants, fertilization selectivity has certain specific features. In the course of generations, such plants may undergo certain changes of attitude with regard to alien pollen and that of the plant itself (which is equivalent to a change in the direction of fertilization selectivity). Heterosis and fertilization selectivity are connected, and the teleological interpretation of this problem is inadmissible. In each specific crossing the combination of male and female gametes is not determined by chance but by combined physiological, biochemical, anatomical and cytological factors. The general direction in which these factors exercise their influence is historically determined. It also displays dependences on internal and external factors, sometimes governed by definite laws."

1157 *Rajan, S. S. The evolution of yellow sarson,* Brassica campestris *var.* sarson: *a self-compatible race in a self-incompatible group.* (*pp. 336–37*).

The mating system in the 10-chromosome species of *Brassica* is controlled by self-incompatability alleles with the exception of yellow sarson, this race being predominantly self-pollinated. Cytogenetic studies of crosses between yellow sarson and self-incompatible toria and brown sarson were carried out. These revealed that yellow sarson and toria differ with respect to chromosomal inversion. Of five characters closely associated with the mode of pollination, four were found to be controlled by genes showing two-factor interaction of the complementary type; characters favouring self pollination were recessive in three and dominant in two cases. All five characters are located on the same chromosome, with recombination values ranging from 19·4 to 48·2%; where the character favouring self pollination was dominant, the phase of linkage was repulsion. Yellow sarson was cross compatible with toria or brown sarson only as the mother parent. Unilateral crossability indicates that the self compatibility is of the primary type rather than a secondary compatibility derived from pre-existing incompatibility. Analysis of the filial generations of the cross revealed that self fertility behaves as a simple Mendelian recessive; the locus concerned therefore seems to be independent of the incompatibility alleles.

It is suggested that yellow sarson originated from the self-incompatible race from the Himalayas. Self fertility was conferred by a recessive mutation of a major gene independent of the self-incompatibility loci but inactivating them. Genes favouring self pollination accumulated under natural selection and became closely linked by means of a recombination-suppressing mechanism such as a chromosomal inversion.

1158 *Stanton, W. R. The origin of the races of maize in West Africa.* (*p. 337*).

From a survey of the maize types of western Africa it is concluded that the "Early Caribbean" race was introduced by a desert route involving Spain, Venice, Turkey and Egypt. A second race was brought from Brazil by a direct sea route. Certain ethnological factors have tended to preserve these races and in particular the northern introduction; extensive introgression did not occur until recently. It is suggested that certain maizes occurring in areas north of the ninth parallel are more closely related to the early Columbian introduction than those of almost any other part of the Old World.

1159 *Tsitsin* [*Cicin*], *N. V. The creation of new species and forms of the cereals by the method of distant hybridization.* (*pp. 337–38*).

In the USSR, hybridization between *Triticum* and *Agropyron* using *A. glaucum*, *A. elongatum*, *A. junceum*, *A. trichophorum*, and *A. repens* has produced new species of perennial wheat and species yielding grain and forage of high protein content; also two new winter wheats, *T. vulgare* var. *alboramosum* and *T. vulgare* var. *rubroramosum*, were developed. The sterility of the F_1 generation of *Secale* x *Agropyron* was overcome by the induction of polyploidy. F_1 plants from certain crosses, usually difficult to achieve, were obtained by excising the embryos and growing them in nutrient media. In this way, hybrids have been obtained from the following crosses: *Triticum* x *Elymus arenarius*, *Triticum* x *E. giganteus*, *Triticum* x *E. mollis*, *Hordeum* x *E. giganteus*, *Secale* x *E. arenarius* (*Triticum* x *Agropyron*) x *E. arenarius* and (*Triticum* x *Agropyron*) x *E. giganteus*. Grains were recovered from F_1 plants, of *Triticum* x *E. giganteus* after treatment with colchicine and repeated pollinations.

1160 *Turbin, N. V. New data on the biology of fertilization of seed plants.* (*p. 338*).

Experiments carried out in the USSR with varieties of *Triticum vulgare* and *T. durum* revealed that the percentage of ovules fertilized and the weight of the seeds produced are higher under natural conditions of pollination than they are when the flowers are isolated. The difference in fertilization is due to additional cross pollination in the former case; some interaction occurs between self and foreign pollen. Similar results have been obtained with tomatoes and other self-pollinated plants. Similarly cross pollination of emasculated flowers of rye is less effective than cross pollination of nonemasculated plants, when interaction of self and foreign pollen is possible. The setting of seed in rye inbreds is increased 10 or 12 times when additional foreign pollen is applied.

Foreign pollen is only effective in increasing seed set when it comes from species related to the mother plants; for positive results, the pollen must be able to germinate on the stigmas. It is thought that the foreign pollen probably acts by "extracting" biologically active substances effecting the germination of pollen of the mother species and in some cases strengthening the fertilization capacity of the mother plant.

1161 *Weinstein, A. Did Nägeli fail to understand Mendel's work?* (*p. 339*).

It is thought that Nägeli did not forget Mendel's work when writing his own book on heredity and evolution; although the book contains no mention of Mendel it shows that Mendel had some influence on Nägeli.

1162 McLaren, A.
International scientific meetings, Montreal: Congress of Genetics.
Discovery 1958 : **19** : 460–73.

A brief account is given of points of special theoretical interest raised at the above congress [cf. 926–1161].

1163 Šmal'gauzen, I. I.
(Hereditary information and its transformation).
Dokl. Akad. Nauk SSR (Proc. Acad. Sci. USSR) 1958 : **120** : No. 1 : 187–90. [Russian].

Population genetics, stabilizing selection, individual development and the relation between phenotype and genotype are discussed as examples of information transfer [cf. 1095].

1164 Lewis, D.
Gene control of specificity and activity: loss by mutation and restoration by complementation.
Nature, Lond. 1958 : **182** : 1620–21.

The chief feature of mutant *S* alleles in *Oenothera organensis* has been complete loss of antigenic activity in the pollen. The interactions of mutant with normal alleles in diploid pollen of autotetraploids have been found to be essentially similar to those of normal alleles in pattern of dominance, recessiveness and competition. This result is regarded as confirming the "one-specificity one-carrier" hypothesis, rather than the "two-specificity" interpretation of the mutants. According to the former hypothesis, one part of the *S* gene determines specificity of antigenic activity while another part determines "a carrier responsible for the activity in pollen and style," a mutation being a defect in the activity-conditioning part. According to the latter interpretation, two parts of the *S* gene control specificity, one for the pollen and the other for the style, mutation being due to loss of the part determining pollen specificity or to changed specificity. One new interaction was detected in pollen with S_2 and S'_4 alleles. The original allele S_4 is almost completely independent of S_2 in the diploid grain, as indicated by inhibition of S_2S_4 pollen in a style with either S_2 or S_4 and by the stronger inhibition in an S_2S_4 style. $S_2S'_4$ grains are inhibited in S_2 styles but undergo little or no inhibition in S_4 styles. Inhibition of $S_2S'_4$ pollen is complete in S_2S_4 styles. Thus S'_4, inactive in the haploid grain, is restored to activity when accompanied by S_2. The latter allele restores the activity of S'_4 not by imposing its own specificity but by allowing S_2 to produce its original specificity.

This situation is most nearly paralleled by genes in *Neurospora* which restore the capacity to produce tryptophane desmolase in mutants lacking the enzyme, as reported by Yanofsky [cf. XXVII, p. 154], and by the complementary action of two different alleles in the production of glutamic dehydrogenase in heterocaryons of the same organism, as described by Fincham and Pateman [cf. XXVII, 3728].

1165 Stent, G. S.
Bacteriophage research. Second Royaumont Colloquium.
Nature, Lond. 1958 : **182** : 1769–70.

An account is given of the proceedings of the Second International Phage Colloquium, held during 28 July–2 August, 1958, at Royaumont near Paris. The sessions consisted of informal discussions only, after introductory talks. The topics considered were the anatomy of the phage particle, metabolism of infected bacteria, synthesis of phage constituents, kinetics of recombination, the elementary recombination event, genetic fine structure, replication, prophage and the bacterial chromosome, transduction, phage conversion and bacteriocins. Some of the developments referred to are as follows. E. Kellenberger showed by means of electron micrographs that phage-precursor DNA exists in at least two different states before its maturation, a fact requiring to be taken into consideration if biochemical and genetic pool estimations are to be correlated. In the course of intracellular phage growth, the bacterial "nucleoids" disintegrate to give way to a pool of viral DNA. At later stages, but prior to its encapsulation into morphologically intact and infective virus particles, this pool crystallizes into hexagonal, prophage structures, which break up into free DNA and protein "doughnuts" if the cell is lysed prematurely. An interesting advance in the study of the role of viral DNA in viral protein synthesis was reported by G. Brown, who appears to have succeeded in inducing *in vitro* the formation of small but significant amounts of phage tail antigens by addition of purified viral DNA to preparations of disrupted bacterial cells. In the discussion of DNA replication, F. W. Stahl summarized the results of his and M. Meselson's experiment, in which the density of the DNA of bacterial cultures initially labelled with N^{15} was examined after various periods of growth in nonlabelled media. By means of this procedure, it was shown that replication of bacterial DNA follows the course envisaged by Watson and Crick, i.e. the two complementary polynucleotide strands of the DNA macromolecule appear to separate from each other and join up with single, *de novo* polynucleotide chains to form two replica molecules, each containing one old and one new strand. C. Bresch presented a new analysis of the population dynamics of genetic recombination in phage, elaborated independently by himself and by F. W. Stahl and C. Steinberg. This treatment represents a generalization of the Visconti-Delbrück theory, in that the nature of the elementary recombination event is not presupposed and the pair-wise mating event postulated in the earlier theory is replaced by a "cooperation" in which the number of participating particles may be greater than two. R. Edgar and A. H. Doermann each discussed new experiments with bearing on the problems of heterozygotes. Edgar concluded that heterozygotes are formed at the moment of genetic exchange and that negative interference occurs at the time of segregation of the heterozygote. Contrary to the "overlap" model of heterozygote structure which is favoured by many investigators and which predicts that phages heterozygotic for only the middle locus of the loci for three closely linked markers should be much less frequent than those heterozygotic for either of the outside loci, Doermann found that all three types appear in roughly equal numbers. S. Benzer described his work on mutation in the cistron of bacteriophage. The spectra of mutations induced by 5-bromouracil [cf. XXVIII, 3708], 2-aminopurine and proflavine, all of which enhance the overall rate of mutation, are distinctive, in that each of the three mutagens is associated with a particular set of highly mutable sites and less mutable sites, totally unlike the set identified either among spontaneous mutants or among mutants induced by the other two mutagens. Since the mode of action of each of these mutagens has been already formulated in terms of DNA structure as proposed by Watson and Crick, the mutational spectra show promise of offering a means of bridging the gap between chemistry and genetics. Recent studies by J. Lederberg, by P. Frédéricq and by F. Jacob have revealed that the bacterial fertility factor *F*, the prophage and the colicinogenic factor have certain features in common which set them apart from other bacterial genes. On the basis of these special properties, F. Jacob and E. L. Wollman have proposed a new concept, the episome, defined as an exogenous hereditary determinant integrated into the bacterial genome by addition to the chromosome instead of replacement of allelic bacterial loci. The episome may also exist in an autonomous state, in which it is replicated independently of the rest of the bacterial genome.

1166 Kriviskij, A. S.
(The nucleic acids and the multiplication of viruses).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1958 : **45** : 286–312. [Russian].

A review of research on the chemistry and biological nature of viruses is presented. In particular the relations between heredity on the one hand and nucleic acids and proteins on the other are discussed.

1167 Čajanov, S. K.
(An eminent Russian scientist, the biologist and botanist N. I. Vavilov).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. **3** : 145–46. [Russian].

This biography of N. I. Vavilov, written on the occasion of his 70th birthday anniversary, commemorates his researches in genetics and related subjects.

1168 Žukovskij, P. M.
(In commemoration of N. I. Vavilov).
Bjull. Vsesojzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 3–5. [Russian].

This brief biography of Vavilov, who died on 2 August 1942, gives an appreciative account of the researches carried out by him in plant introduction, breeding, genetics and related subjects.

1169 Grigg, G. W.
The genetic control of conidiation in a heterokaryon of *Neurospora crassa.*
J. gen. Microbiol. 1958 : **19** : 15–22.

A microconidial noncolonial heterocaryon was produced from mixtures of a macroconidial colonial homocaryon (*col*–1; $m\ su^{m}$) and a homocaryon (*col*–1^{+}; $m^{+}su^{m+}$). The genes referred to govern the following phenotypes: *col*–1, restriction of growth habit and of production of conidia; *m*, production of microconidia in the presence of *col*–1; and su^{m}, interaction with *m* in the presence of *col*–1 to produce macroconidia. At the particular ratio of the two types of nuclei obtaining in the heterocaryon, su^{m} acted as recessive to su^{m+}, and *m* behaved as dominant over m^{+}, while for the gene *col*–1, suppression of macroconidia and the production of microconidia in the presence of *m* were dominant but restriction of growth habit was recessive. By increasing the proportion of *col*–1: msu^{m} nuclei in the heterocaryon, growth rate decreased and production of macroconidia increased at the expense of production of microconidia.

1170 Takemaru, T.
(Genetics of *Collybia velutipes.* VI. Linkage study of a spontaneous physiological mutant).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 286–92. [Japanese].

A monocaryon carrying mutant genes for colourless mycelium (*c*), slow growth (*fa*) and reduced aerial myclium (*ae*) was isolated. Hybridization studies between this form and the normal wild-type monocaryon showed that the above three genes were linked in the order quoted but were not linked with either of the incompatibility factors, *A* or *B*. [Cf. XXVIII, 90–1].

1171 Elliott, C. G.
Environmental effects on the distribution of chiasmata among nuclei and bivalents and correlation between bivalents.
Heredity 1958 : **12** : 429–39.

Chiasma frequencies were scored at the first metaphase of meiosis in plants of *Endymion non-scriptus* and a diploid variety of hyacinth, these plants being kept at various temperatures. The variances of the distributions of chiasmata among nuclei and among the bivalents of the nuclei were found to be differently affected by the environment; this indicated that these distributions are independent and determined by different physiological processes.

"Different types of correlation between the chiasma frequencies of the bivalents may be observed when one of the variances is altered without any change in the other. The results with hyacinths are especially important; here, changes with temperature in the inherent variance (between bivalents), unaccompanied by changes in the internuclear variance, were associated with different types of correlation. In *Endymion non-scriptus*, bulbs at the same temperature, and even different anthers in the same bulb, showed differences in internuclear variance, which, unaccompanied by changes in the inherent variance, were associated with different types of correlation.

"Finally, as illustrated in *Endymion*, no correlation is expected between different bivalents if the variance of the chiasma frequency of one or both of them is low. If the variance for both bivalents is high, a significant correlation may occur."

1172 Whitehouse, H. L. K.
Use of loosely linked genes to estimate chromatid interference by tetrad analysis.
Nature, Lond. 1958 : **182** : 1173–74.

On the basis of a method previously described [cf. XXVII, 37], it is shown that tetrad genotypes of the (*a*) 2-strand, (*b*) 3-strand and (*c*) 4-strand double-cross-over types may, where the loci involved are loosely linked, also arise through the occurrence of triple cross-overs. The frequency of the latter can be estimated from the observed frequency of tetrads (*d*) showing a 4-strand double cross-over between two of three linked loci and a third cross-over between one of these two and the third locus. If the frequencies of tetrads of genotypes (*a*), (*b*), and (*c*) do not differ significantly from 1 : 2 : 1 as is the case in the data obtained by Strickland in his cross 2 [cf. XXVIII, 3729], then either (1) successive cross-overs occur at random or nearly so, or (2) there is chromatid interference but its occurrence has been obscured owing to triple cross-overs. From the frequency of tetrad genotypes (*d*) in Strickland's cross, it is estimated that about two-thirds of the 124 asci of genotypes (*a*), (*b*) and (*c*) have resulted from double cross-overs and have consequently provided valid information about the strand relationships between the crossovers. A larger sample of tetrads would therefore be expected to show a significant deviation from the 1 : 2 : 1 ratio, if there is chromatid interference. It cannot be concluded, however, that there is such interference, since alternative (1) above has not been ruled out. The method described can thus be used for the estimation of the magnitude of interference but not for detecting it in the first place.

1173 Chase, M. & Doermann, A. H.
High negative interference over short segments of the genetic structure of bacteriophage T4.
Genetics 1958 : **43** : 332–53.

In these studies of high negative interference, seven A-cistron and three B-cistron *r*II mutants were used in a variety of combinations in biparental crosses involving two, three or four factors. The results showed the existence of linearity within the individual functional units of the *r*II region; the data also indicated "that the observed excess (assuming coefficients of coincidence of one) of double and triple recombinations is the result of multiple-recombination events in short segments of the genetic structure, and that the frequency of such events is inversely related to the length of the map interval being studied. That the excess wild-type recombinants are due to reversions or to gene conversion is unambiguously ruled out". All recombination events are supposed to take place in short "switch areas" which occur at random throughout the genome. High negative interference is more pronounced when the markers under study are located close together because their chance of inclusion in a single switch area is then increased. Using this model, it has been possible to account in a qualitative manner for all the data obtained from the crosses studied.

1174 Leupold, U.
Physiologisch-genetische Studien an adenin-abhängigen Mutanten von *Schizosaccharomyces pombe.* Ein Beitrag zum Problem der Pseudoallelie. (**Physiological and genetical studies on adenine-requiring mutants of *S. pombe.* A contribution to the problem of pseudoallelism**).
Schweiz. Z. allg. Path. 1957 : **20** : 535–44.

From analyses of crosses of adenine-requiring mutants, two gene regions have been mapped. Three genes are located in the ad_2 region (0·05 morgans) and the ad_7 site (0·15 morgans) is represented by 11 genes, there being at least nine loci. According to genetic criteria, the loci in these two regions are not allelic, but in their physiological action they do behave as two allelic series. The three ad_2 mutants show a defect in the amination of hypoxanthine in the sixth position of the carbon ring; consequently hypoxanthine accumulates and the mutants require adenine. Purine synthesis is blocked at an earlier stage in the ad_7 mutants but in each mutant it is the same step of the reaction that is defective; all the mutants accumulate a red pigment [cf. XXVII, 1182]. The only physiological differences found within these two species of mutants concern the degree of adenine requirement under various external and internal conditions. For example at 30° C. one of the ad_2 mutants is able to grow without adenine and at 25° C. two of these mutants can do this. The presence of a suppressor gene also influences variously the adenine requirements of the ad_7 mutants.

Various hypotheses seeking to explain pseudoallelism are considered in relation to these results, reference also being made to investigations on other organisms.

1175 Taran, L. D.
(**An apparatus for artificial pollination of plants in hybridization**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 3 : 67–68. [Russian].

A needle-pointed syringe for pollinating bagged ears of wheat or inflorescences of tomatoes has been developed at Odessa. It is economical of pollen, causes no injury to plants and requires no removal of the cellophane bags, the holes made in them by the needle being easily patched up with glue.

1176 Perutz, M. F.
Some recent advances in molecular biology.
Endeavour 1958 : **17** : 190–203.

In the light of recent findings, the following topics and others are discussed: the relationship between genes and enzymes, the structure and replication of genetic material, the role of nucleic acids in protein synthesis, the effect of mutations on proteins and the structure of small viruses and microsomal particles.

1177 Louis-Marie, P.
Comment agissent les gènes. (**How genes act**).
Rev. Oka 1958 : **32** : 120–22.

This question is briefly considered in the light of recent research on the biochemistry of genetics.

1178 Lindegren, C. C.
The integrated cell.
Cytologia, Tokyo 1957 : **22** : 415–41.

Chiefly with reference to investigations on the physiology and genetics of yeast, the author argues in favour of the following hypotheses. (1) The nucleus and cytoplasm are competitive and mutually exclusive in their growth. (2) The destruction of the genic specificity of DNA by DNase does not necessarily prove that DNA is the exclusive component of the gene. DNA may have merely a structural function in holding together a coacervate comprising the genes. (3) The integrated cell may have arisen in the following way. Two principal kinds of bionts, one forming RNA and the other DNA, may have competed at an early stage in the evolution of living organisms with other bionts lacking nucleic acids. Cytoplasmic bionts, synthesizing RNA, would have been at an advantage when uracil and ribose were abundant in the environment whereas nuclear bionts, synthesizing DNA, would have been at an advantage when thymine and deoxyribose were abundant. Symbiosis between the DNA and RNA plasmas could have been rendered effective by alternative and interdependent synthesis of DNA and RNA, as in the diphasic growth of the nucleus and cytoplasm in yeast. (4) Differentiation is effected by genes which directly control the synthesis of adaptive enzymes in response to specific cell environments. (5) The gene is a secondary rather than a primary component of the cell. With reference to (5), it is suggested that control of activities such as synthesis of the oxidative enzymes has been transferred from the cytoplasm to the nucleus, such localization of control having the advantage of much greater efficiency. "The first step might be unequal crossingover producing an extra length of chromatin with a duplicate and therefore useless function. This duplicated plastic material would next receive impressions leading to the initiation of a structure controlling the synthesis of oxidative enzymes thus transferring the capacity from the cytoplasm to the nucleus." Ability of aerobic respiration in yeast exemplifies metabolic properties which have however remained under cytoplasmic control; possibly the survival value of aerobic respiration as a permanent gene-controlled capacity would be negative. As regards the nature of gene action, evidence from investigations on synthesis of melezitase through the action of multiple alleles at locus *MZ* has suggested that enzyme formation involves at least four components: (1) the "trigger" which consists of the surface configuration and which is nonspecific in response to inducers, (2) the path along which the stimulus passes, (3) a receptor which responds to the stimulus and (4) a specificity-conferring catalyst which contains RNA and is transferred from the nucleus, presumably from the nucleolus, into the cytoplasm where it initiates enzyme production [cf. 892].

1179 Beadle, G. W.
The genetic basis of biological specificity.
J. Allergy 1957 : **28** : 392–400.

For the benefit of the nongeneticist, the author discusses the nature of the gene, reaching the conclusion that the structure proposed by Watson and Crick for DNA provides a suitable chemical basis for interpreting the specificity, replication, mutation and functioning of the genetic material.

1180 Davis, R. J. (Jun.)
A temperate bacteriophage associated with some species of nodule bacteria.
Diss. Abstr. 1958 : **18** : Publ. No. 25,204 : p. 362. (Abst.).

A temperate phage of root nodule bacteria is reported; this phage attacks many strains of several species of bacteria. Modification of the genetical material of rhizobial strains through phage mediation was observed; for example ability to infect leguminous plants and to fix nitrogen were checked.

1181 Ozeki, H. & Stocker, B. A. D.
Phage-mediated transduction of colicinogeny in *Salmonella typhimurium*.
Heredity 1958 : **12** : 525–26. (Abst.).

When cells of a noncolicinogenic strain are mixed with cells of a suitable colicinogenic strain, colicinogeny is rapidly transferred to the former, this transfer probably being effected by cell conjugation. *Shigella sonnei* 'P9' produces two colicins, C_1 (probably colicin I) and C_2 (probably colicin E). P9 was mixed with the noncolicinogenic strain LT2 of *S. typhimurium*; clones of the latter producing C_1 alone and others producing C_1 and C_2 were then obtained. The results were similar when the doubly colicinogenic strain of *Salmonella* was mixed with a genetically-marked noncolicinogenic strain.

Phage PLT22 grown on doubly colicinogenic *Salmonella* was applied to a noncolicinogenic *Salmonella* strain; some colicinogenic clones were obtained, the transduction frequency being similar to that of other characters. All the colicinogenic clones so obtained were found to produce only C_2.

1182 Zinder, N. D.
"Transduction" in bacteria.
Sci. Amer. 1958 : **199** : No. 5 : 38–43.

The author gives a popular account of experiments begun in 1949 by himself and Lederberg which demonstrated the occurrence of transduction in *Salmonella*. He also describes the relationship between latent infection and transduction and the genetical significance of further research on transduction.

1183 Ivánovics, G. & Nagy, E.
Hereditary aberrancy in growth of some *Bacillus megaterium* strains.
J. gen. Microbiol. 1958 : **19** : 407–18.

"Two hundred strains of *Bacillus megaterium* recently isolated from soil were tested for an antagonistic effect on a phage-resistant strain of the same species. Fifty-one strains gave a zone of inhibition on a lawn of the indicator strain. This effect was increased by a small dose of ultraviolet radiation which also caused 41 other strains to show an antagonistic effect. Sixteen strains which were completely lysed after u.v. irradiation also produced confluent lysis of the indicator strain. When grown in liquid media, these strains gave irregular growth curves owing to partial lysis during the exponential phase. Lysis was almost complete when such cultures were incubated after exposure to small doses of u.v. radiation. Lysis was always associated with accumulation of the antibacterial principle previously named 'megacin'. Irregular growth in liquid media and production of megacin were strictly correlated. However, only 2 megacinogenic strains were lysogenic and liberated phage. Populations of megacinogenic strains were examined by replica-plating for the presence of non-megacinogenic mutants. Spore suspensions of 4 megacinogenic strains contained non-megacinogenic mutants in various proportions depending on the strain and the particular sample. Non-megacinogenic mutants could not be made to lyse by exposure to u.v. radiation; did not produce any antibacterial effects; and all showed normal patterns of growth in various liquid media. It is supposed that megacinogeny and aberrant growth, as well as inducibility by u.v. radiation, of some *B. megaterium* strains are governed by a single hereditary unit (gene). It cannot be decided at present whether or not this unit is a highly defective prophage."
[Authors' summary].

1184 Harm, W.
Zur Deutung der unterschiedlichen UV-Empfindlichkeit der Phagen T2 und T4. (**The interpretation of the different ultraviolet sensitivity of the phages T2 and T4**).
Naturwissenschaften 1958 : **45** : 391–92.

It has already been shown that the differences in ultraviolet sensitivity and capacity for photoreactivation of phages T2 and T4 are determined by a unit character [cf. XXVI, 2050]. T4 has the *u* allele and T2 has u^+. Further investigations have indicated that primary photochemical effects are similar for both phages but the number of lethal effects in a cell is reduced by the *u* allele; it is suggested that the *u* allele sets off processes which result in the restoration of certain lethal hits; these are probably the same as those which may be photoreactivated.

1185 Cavalieri, L. F. & Rosenberg, B. H.
The interpretation of bacterial transformation data.
Proc. nat. Acad. Sci. USA 1958 : **44** : 853–57.

"The treatment of bacterial transformation data is discussed and equations are developed connecting the variables. It is shown that the observed number of transformants is the product of three factors, namely: *a*) the number of marked DNA molecules present ($NX/\bar{M}$), *b*) the ability of these molecules to enter the bacterium [$k_{\mathrm{m}}K_{\mathrm{m}}/k_{\mathrm{m+c}}K_{\mathrm{m+c}}$) ($\bar{M}/\bar{M}_{\mathrm{abs}}$)] and *c*) the ability of the molecules which have entered the cell to become part of the genome [N being Avogadro's number, X the ratio of number of marked molecules to total number of molecules, $\bar{M}$ the number average molecular weight of the total DNA, M_{abs} the number average molecular weight of the absorbed DNA, and k_{m}, K_{m}, $k_{\text{m+c}}$ and $K_{\text{m+c}}$ constants]. To calculate the sizes of genetic markers or to estimate the efficiency of fractionation procedures the quantity $NX/\bar{M}$ must be evaluated from the observed data. To do this the terms *b*) and *c*) must be known. Absorption and inhibition experiments are presented to show that *b*) is a function of molecular weight, and it is possible that this is also true of *c*). Since at present the nature of the function is unknown, an explicit solution for the number of markers present is impossible. It is concluded that the estimation of the size of a marker presents formidable difficulties. Further, the 'sizes' that have been calculated in the literature, on the implicit assumption that *b*) and *c*) are constant have no meaning at the molecular level. These values are clearly some indefinable average of molecular parameters. The same criticism applies to fractionation procedures."

[Authors' summary].

1186 Spizizen, J.

Transformation of biochemically deficient strains of *Bacillus subtilis* by deoxyribonucleate.

Proc. nat. Acad. Sci. USA 1958 : **44** : 1072–78.

Three auxotrophic mutants were transformed to nutritional independence with DNA isolated from a wild type of *B. subtilis*. As little as 2×10^{-4} g. of DNA effected transformation of heat-treated spores germinated in a minimum medium containing glucose. The number of transformants was directly related to the quantity of DNA added. Transformation was prevented by treatment with DNase. Removal of protein from the donor DNA increased transforming activity a hundred to a thousand times. The activity was considerably enhanced by an unidentified component in yeast extract. Transforming capacity was very stable when the DNA was stored for a period of months in 2M NaCl at 4° C. About 99% of the activity was destroyed by storage in 0·1M NaCl at 4° C. for 2 days. The activity was reduced to 99·9% of the original by slow freezing of the DNA in 2M NaCl at − 20° C. and subsequent thawing at 37° C. When the DNA was heated at 70° C. for 30 min., the minimum quantity capable of effecting transformation remained unchanged, although the number of transformants produced with a given quantity was reduced.

1187 Pakuła, R., Fluder, Z., Hulanicka, E. & Walczak, W.

Studies on transformation of streptococci.

Bull. Acad. polon. Sci., Sér. Sci. Biol. : 1958 : **6** : 319–23.

It is shown that *Streptococcus viridans*, *S. sbe* and hemolytic streptococci of the serological group H are capable of transformation to streptomycin resistance by DNA extracts from hemolytic and nonhemolytic streptococci and enterococci.

1188 Pakuła, R., Hulanicka, E. & Walczak, W.

Transformation reactions between streptococci, pneumococci, and staphylococci.

Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1958 : **6** : 325–28.

The *Pneumococcus* strain R36A was able to act both as donor and recipient in transformation experiments with *Streptococcus viridans*, *S. sbe* and hemolytic streptococci. DNA from *Staphylococcus* 'St. 70 Sm$^{\text{r}}$' was able to transform streptococci of the two last groups.

1189 Sánchez-Monge, E.

Equilibrio en poblaciones parcialmente alógamas. (**Equilibrium in partially allogamic populations**).

Bol. Inst. Invest. agron., Madr. 1958 : **18** : No. 38 : 295–300.

It is shown that in a partially allogamous population, equilibrium for the locus *Aa* occurs at the following zygotic frequencies: genotype *AA*, $(s - \alpha s + 2\alpha s^2)/(1 + \alpha)$; *Aa*, $(4\alpha s - 4\alpha s^2)/(1 + \alpha)$; and *aa*, $(1 + \alpha - s - 3\alpha s + 2\alpha s^2)/(1 + \alpha)$; where α is the rate of crossing and s the relative frequency of A. A nomogram for the determination of unknown values in the above equations is presented. It consists of an equilateral triangle in which the base represents values of s and in which the point of equilibrium for each value of α moves along a parabola passing through the ends of the base of the triangle; the distances of the point of equilibrium from the sides of the triangle, for given values of $s + \alpha$, then represent the respective zygotic frequencies.

1190 Lewontin, R. C.

A general method for investigating the equilibrium of gene frequency in a population.

Genetics 1958 : **43** : 419–34.

The system investigated involves 2 alleles but no restriction on nature of selection, mating system, mutation, migration or normality of segregation. Given that two alleles A, a in any particular generation are in the relative proportions p_0, q_0, then the frequencies of AA, Aa, aa in the next generation can be represented as $U_{11}p_0^2$, $U_{12}2p_0q_0$, $U_{13}q_0^2$,† respectively. The equilibrium value, $\hat{q}$, is then given by $\frac{U_{11} - U_{12}}{U_{11} + U_{22} - 2U_{12}}$, and this is stable if $\frac{d \triangle q}{dq}\Big|_{\hat{q}}$ is negative.

Determination of the weights U_{11}, U_{12}, U_{22} for (1) inbred populations with constant selection, (2) populations showing reproductive compensation, (3) balanced selection and mutation and (4) a case involving abnormal segregation ratios is illustrated.

The extension of the method to n alleles is considered.

It emerges from the foregoing that balanced polymorphism is mathematically feasible in the absence of heterosis.

1191 GRIFFING, B.
Application of sampling variables in the identification of methods which yield unbiased estimates of genotypic variance components.
Aust. J. biol. Sci. 1958 : **2** : 219–45.

Five steps are recommended for determining the problem of the title: (1) definition of the population parameters; (2) definition of the sampling procedure; (3) construction of a mathematical model; (4) derivation of the expectation of mean squares; and (5) demonstration that unbiased estimates can be obtained from the observed mean squares. The procedure recommended involves the use of Cornfield's sampling variables with, however, replacement after random sampling.

The method is exemplified with reference to three sets of conceptual experimental material used for estimating general and specific combining abilities: (1) a set of hybrids of the type L x T between all elements of two independent random samples, $L_1, L_2, \ldots, L_a$ and $T_1, T_2, \ldots, T_a$ of an inbred population π, (2) four types of diallel cross based on a single sample of π [cf. XXVII, 1034], and (3) all crosses of the type L^* x T^* between all elements of two independent random samples $L_1^*, \ldots, L_a^*$ and $T_1^*, \ldots, T_a^*$ drawn respectively from two inbred populations π_1 and π_2.

1192 YANOFSKY, C.
Restoration of tryptophan synthetase activity in *Escherichia coli* by suppressor mutations.
Science 1958 : **128** : 843–44.

As in the case of mutants of *Neurospora crassa* defective in ability to form tryptophane synthetase (TSase) [cf. XXVI, 950 and 2031], mutants of *E. coli* with this deficiency fall into two categories, one group producing a protein (CRM) immunologically similar to TSase while the other group does not. The latter group appears to be comparable to the td_1 type in *Neurospora.* Transduction tests of ultraviolet-induced tryptophane-independent types derived from an *E. coli* stock lacking CRM indicated that suppressor genes were responsible for the tryptophane independence in some cases and reverse mutation in others. This response to suppressors is in contrast to the behaviour of the td_1 type, which has only undergone reverse mutation. The TSase of all the tryptophane-independent mutants of *E. coli* was normal in that about equivalent amounts were neutralized by TSase antiserum. The suppressed mutants appeared however to form somewhat less TSase than the reversals and wild type.

1193 ADELBERG, E. A.
Selection of bacterial mutants which excrete antagonists of antimetabolites.
J. Bact. 1958 : **76** : p. 326.

Mutants of *Escherichia coli* have been isolated which excrete substances antagonistic to one or more of 13 antimetabolites. Some are specific while others are resistant to serine methyl ester, norvaline, ethionine and norleucine.

1194 HOWARTH, S.
Suppressor mutations in some cystine-requiring mutants of *Salmonella typhimurium.*
Genetics 1958 : **43** : 404–18.

"Genetic tests are reported with eight suppressors (*su–cys–*1 to *su–cys–*8) isolated independently from cystine-requiring mutants of *Salmonella typhimurium,* two from the multisite mutant *cys–*20 and six from single site mutants of the *cysA* and *cysF* loci. These tests show that at least five and probably all eight of these suppressors are nonspecific and suppress both the multisite mutant *cys–*20 and all known single site mutants of the two loci, namely, *cysA–*1, –3, –13, –21, –69, –82, *cysF–*22, –32."
[Author's summary].

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† Presumably $U_{22}q_0^2$ is intended.

1195 Tanami, Y.
(Studies on host-range mutation in T2 phage. II. On the frequency distribution of the group of h^c mutant phages among infected bacteria).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 223–28. [Japanese].

[Cf. XXVII, 3671].

1196 Robbelen, G.
Instabile Genmanifestation nach Röntgenbestrahlung von *Arabidopsis thaliana* (L.) Heynh. [**Unstable gene expression following X irradiation of *A. thaliana* (L.) Heynh**].
Z. Naturf. 1958 : **13b** : 14–16.

An X-ray-induced, recessive *chlorina* factor in *A. thaliana* decreased in expression from its highest value in the F_2 to a constant value in the F_7. The rapidity of the decrease in expression was increased by crossing with normal mother plants but decreased by growth of the mutants at low temperatures. It is suggested that these changes do not result from alterations in the hereditary structure but that radiation-induced effects upon gene-dependent physiological effects are involved.

1197 de Serres, F. J. & Kølmark, H. G.
A direct method for determination of forward-mutation rates in *Neurospora crassa.*
Nature, Lond. 1958 : **182** : 1249–50.

The mutation of the slow-growing albino (*al*–2) strain 76–OR2–7A to purple mutants (*ad*–3) after X irradiation was studied. Identification of the mutants was facilitated firstly by increasing pigment production through the addition of adenine at levels limiting growth and through incubation at 37° C. and secondly by separating the individual conidia and growing them in a viscous agar medium allowing distinct colonies to develop. Of the 191 purple mutants obtained, 35 were *ad*–*3A* and 156 *ad*–*3B*, as identified by means of heterocaryon tests. The induced rate of mutation at the second locus was 4–5 times higher than that at the first for each of four dose levels tested, from 4·5 to 72 kr. At 55 kr., the maximum forward mutation rates are calculated as 9·7 and 2·1 per 10^6 viable conidia treated for the *ad*–*3B* and *ad*–*3A* loci respectively. The survival curve indicated that not all the conidia were uninucleate.

1198 Loutit, J. F.
Biological effects of radiation.
Nature, Lond. 1958 : **182** : 1118–19.

Among papers presented at the Second United Nations International Conference on the Peaceful uses of Atomic Energy was one by Haas and Doudney showing that in irradiated bacteria aminoacids and energy sources are prerequisites for mutation [cf. XXVIII, 3709].

Proceedings of the Seventeenth Annual Meeting of the Soil and Crop Science Society of Florida, Gainesville, December 3, 4 and 5, 1957.
1957 : **17** : Pp. 331.

The proceedings of the above society included a short symposium on Radiation Genetics at which the following papers were contributed.

1199 *Osborne, T. S. Mutation production by ionizing radiation. (pp. 91–107).*

This general survey provides an account of the origin and properties of the genetically important radiations, the effects of radiation on living tissue, the units of measurement employed to denote dosages, and techniques used for irradiation and testing for mutants in crop breeding.

1200 *Teas, H. J. The effects of radiation on genes. (pp. 108–18).*

A discussion of the nature of the gene in terms of the chemical and physical structure of nucleic acid is followed by a consideration of the effects of radiation on genes. It is concluded that the induction of true intragenic mutations by radiation cannot be rigorously proved and that the model proposed by Watson and Crick for nucleic-acid structure offers a plausible basis for gene structure and reduplication. It is however pointed out that until information on the details of reduplication and failure of reduplication of genetic material at a molecular level is available, little advance is possible in the knowledge of how radiation affects genes.

1201 *Edwardson, J. R. The effects of radiation on chromosomes. (pp. 119–29).*

The author briefly reviews (1) the various factors modifying the frequency of chromosome aberrations, (2) aberrations in relation to gene mutation, (3) the effect of radiation in increasing the frequency of crossing over, (4) chemically-induced breakage in comparison with radiation-induced, and (5) uses of aberrations in theoretical investigations and wheat breeding.

1202 *Horner, E. S. The utilization of artificially induced mutations in plant breeding programs. (pp. 130–36).*

After giving a few examples of economically beneficial mutations, the author discusses difficulties which may be encountered in screening for favourable mutations, emphasizes the fact that usually further breeding is required before farmers are able to benefit from a desirable mutation, and indicates the situations in which irradiation is likely to offer the greatest possibilities as a breeding technique.

1203 GUTHRIE, R.
Studies of a purine-requiring mutant strain of *Escherichia coli*. II. Selection of revert strains and its evolutionary significance.
Genetics 1958 : **43** : 386–94.

It was found that a purine-requiring mutant (p^-) of *E. coli* inhibited growth of revert purine-independent cells (p^+), the effect being greater in a minimum glucose-salts medium than in more complex media. Some of the p^+ colonies had satellite growths of p^- cells, when grown in a purine-free, complex medium. Differences were noted between p^+ strains in their sensitivity to p^- cells and in their capacity to feed these p^- cells.

These findings are discussed in relation to evolutionary problems. It is suggested that a biochemical relationship similar to that found between the p^+ and p^- cells of *E. coli* may be involved in the initial maintenance of a single heterotrophic mutation in a prototrophic population. Also such a mechanism of combined antibiosis and cross feeding may have had some part in the establishment of primitive endocrine systems during evolution from the unicellular to the multicellular state.

1204 NAGAI, S. & NAGAI, H.
A new evidence for induction of respiration deficiency in yeast by acriflavine.
Experientia 1958 : **14** : 321–23.

In order to prove the induction of respiratory deficiency by a drug, it is necessary that the respiratory variants which are present in the inoculum or arise spontaneously during growth should have no selective advantage over the normal cells in the population. This may be effected by using a nutrient medium in which sugar is replaced by glycerine. Unlike normal cells, those with respiratory deficiencies are unable to multiply under such conditions; the proportion of respiratory variants in the population therefore decreases. An increase in the number and proportion of respiratory variants occurring in a glycerine medium to which acriflavine has been added indicates that the drug induces respiratory deficiency. This test is simpler and more efficient than other methods hitherto used to prove induction by acriflavine; the test may be used with other supposed inducers.

1205 EHRENBERG, L., LUNDQVIST, U. & STRÖM, G.
The mutagenic action of ethylene imine in barley.
Hereditas, Lund 1958 : **44** : 330–36.

Resting and presoaked seeds of Bonus were treated for 2 hr. in aqueous solutions of ethyleneimine. The mutation rate was estimated from the frequency of ears segregating for chlorophyll-deficient seedlings and found to be a function of concentration. As indicated by the results from resting seeds, the compound was three to five times more efficient as a mutagenic agent than X rays. The two agents did not however differ with respect to the sterility they induced. Ethyleneimine is therefore also highly effective in bringing about chromosomal rearrangements leading to sterility. The lower effectiveness of the treatment when presoaked seeds were used was found to be due to the heterogeneity of the treatment under conditions of slower imbibition of the solution.

1206 GIERER, A. & MUNDRY, K.-W.
Production of mutants of tobacco mosaic virus by chemical alteration of its ribonucleic acid *in vitro*.
Nature, Lond. 1958 : **182** : 1457–58.

Schuster and Schramm have used nitrous acid to convert adenine, guanine and cytosine into hypoxanthine, xanthine and uracil, respectively, while the RNA strand remained intact. On the basis of this work, a study has been made of a symptom of mutation, viz. the production of necrotic lesions on the tobacco variety Java, on which the untreated virus produces chlorotic lesions only. The following results were obtained. (1) The virus and its isolated RNA, when treated with nitrous acid, gave rise to a much larger number of mutations than untreated material assayed at the same concentration. The number was twenty times that occurring spontaneously, when total infectivity had fallen to only half the original value. This occurrence of mutations at low rates of inactivation excluded selection, and could not be due to preexisting mutations or to mutations arising in the plant. (2) The mutagenic effects on the virus and its isolated RNA were equal when the fraction of bases altered in the RNA, measured by t/τ, was the same, t being time of treatment with nitrous acid and τ average time for one lethal conversion of a base per RNA molecule. Virus treated with nitrous acid produced the same proportion of mutations as RNA isolated after treatment. Mutation was therefore the result of reaction with RNA rather than aggregation or changes in the protein. (3) The production of mutations was at first linear with t and followed a single-hit curve, irrespective of varying conditions. Alterations of single nucleotides were therefore mutagenic. It was provisionally estimated that alteration of any one out of 180 of the total 6000 nucleotides in the RNA strand would be mutagenic. (4) Other mutations, characterized by various altered symptoms, were also induced by nitrous-acid treatment and found to be genetically stable in a transfer experiment. The nature of the mutagenic change caused by nitrous acid and the mode of reproduction of the altered RNA are not yet known.

1207 Brenner, S., Benzer, S. & Barnett, L.
Distribution of proflavin-induced mutations in the genetic fine structure.
Nature, Lond. 1958 : **182** : 983–85.

Mutations in the r_{II} region of phage T4Br^{+} were induced by means of proflavin, which interacts with deoxyribonucleic acid but unlike 5-bromouracil does not appear to be incorporated, and were mapped by means of the high-resolution procedure described previously [XXVIII, 3708]. The sites of high mutation rate induced by proflavin did not correspond with those for 5-bromouracil or with the sites showing the highest spontaneous mutation rates, although the latter do coincide with a few of the lower-rate sites in the induced spectra. For proflavin, the existence of single occurrences at many sites suggests that there remain many additional sites at which no occurrence has yet been observed. Bromouracil gave four spots of high mutability and it is thought unlikely that any existing further spots of comparable mutability would not have been indicated. The Poisson distribution for the less mutable bromouracil sites, computed from the ratio of twofold to single occurrences, similarly indicates that only a few sites of this type remain to be discovered.

1208 Schwartz, N. M. & Strauss, B. S.
Effect of tryptophan analogues on reversion of a tryptophan-requiring strain of *Escherichia coli.*
Nature, Lond. 1958 : **182** : p. 888.

Incubation of ultraviolet-irradiated cultures of a tryptophane-requiring mutant in a medium rich in aminoacids including tryptophane resulted in a large number of prototrophs compared with the few obtained from unincubated material. This is in accordance with the hypothesis that protein synthesis is necessary for the fixation of the mutation and involves the utilization or degradation of an ultraviolet-induced mutagen [cf. XXVIII, 3709]. When washed irradiated cells are incubated in a medium lacking tryptophane or with 5-methyltryptophane substituted for tryptophane, few prototrophs are produced, but on subsequent removal to a tryptophane-containing medium, large numbers are again obtained, indicating that the mutagen is stable. Where DL-tryptazan is substituted for tryptophane, the mutagen disappears. Tryptazan was without effect after stabilization of the mutation in a tryptophane medium. It is thought that the difference in effect of tryptazan and 5-methyltryptophane results from the fact that the former but not the latter becomes incorporated in the protein of *E. coli* and destroys the mutagen without producing the mutations for which normal protein formed from tryptophane is necessary.

1209 Northrop, J. H.
Studies on the origin of bacterial viruses. I. The incidence of phage-producing cells in various *B. megatherium* cultures. II. The effect of ultraviolet light on the incidence of phage-producing cells and of terramycin-resistant cells. III. The effect of hydrogen peroxide on the incidence of phage-producing cells and of terramycin-resistant cells. IV. Calculation of the incidence of phage-producing cells. V. The effect of temperature on the terramycin-resistant and phage-producing cells of *Bacillus megatherium* cultures.
J. gen. Physiol. 1958 : **42** : 109–36, 329–34.

A brief report of this work has already been summarized [cf. XXVIII, 3710].

1210 Highkin, H. R.
Transmission of phenotypic variability within a pure line.
Nature, Lond. 1958 : **182** : p. 1460.

In the course of a study of the genetic and environmental factors controlling heat resistance in *Pisum sativum* at the California Institute of Technology, Pasadena, evidence was obtained that the pollen may transmit the effect of environmental conditions upon the pollen parent. In testing the heat resistance of F_1 populations from crosses between and within two pure lines, by raising them at 26° C. and with a 16-hr. photoperiod, it was discovered that, if the source of pollen was not uniform with respect to the environment in which it had been produced, the

F_1 population exhibited a variance in growth considerably exceeding that of either parent. The excessive variance was entirely attributable to difference in the temperature at which plants used as sources of pollen had been grown.

1211 Lysenko, T. D.
(The problem of inheritance).
Agrobiologija (Agrobiology) 1958 : No. 2 : 151–54. [Russian].

Differences between Mičurinist and Mendelian-Morganist genetics are discussed. The Mičurinist concept of the unity of the entire organism with its environment and directed training are advocated and formal genetics is criticized for regarding chromosomes, genes or DNA as units of heredity and for overrating the value of polyploidy. N. A. Dubinin and A. Ėmmė are criticized for advocating polyploidy.

1212 Ol'šanskij, M. A.
(Ten years since the August session of the Lenin Academy of Agricultural Sciences).
Agrobiologija (Agrobiology) 1958 : No. 3 : 3–18. [Russian].

The conflicting trends in Soviet biology preceding the 1948 conference at which Mičurin-Lysenko genetics was accepted [cf. XVIII, 2000] are described. Lysenko's views are reaffirmed and arguments against formal genetics are brought up to date by referring to disagreements between Mendelian geneticists as to whether a chromosome, gene or the DNA molecule constitutes a unit of heredity. By way of contrast to the confusion believed to exist among formal geneticists including some prominent Soviet biologists, the steady progress made by the Mičurinist plant breeders is described. It is said to be illustrated by a large number of improved varieties of economic plants bred in recent years. These include: wheats distinguished by high yield, large grain, winter hardiness, and resistance to drought, pests and diseases; sugar beets with a high root and sugar yield and some varieties resistant to *Cercospora*; *Orobanche*-resistant sunflowers with increased oil contents; and new fine-fibred cotton varieties which are earlier and more productive than 2IZ.

1213 **(Agrobiological science and the false views of the "Botanical Journal").**
Pravda 1958 : **47** : No. 348 (14742).

The achievements of Soviet science reviewed include intercontinental missiles, the first earth satellite, the Mičurinist principle of controlling the nature of plants and animals and the work of T. D. Lysenko. The recognition of the Lysenko principles of agrobiology in the countries in the Soviet sphere of influence is contrasted with the critical attitude of "western reactionaries" headed by T. Huxley [*sic*] and F. Dobzhansky. The achievements of the Mičurinist plant breeders are illustrated by the production of winter wheat varieties such as Novoukrainka, Belaja Cerkov' 198, and Odessa 3, 12 and 16; also by improved spring wheats and cotton varieties which, it is claimed, give the highest yields in the world; sunflowers with higher oil content and improved varieties of sugar beet and maize are also included. Those scientists in the USSR who have criticized the Mičurinist materialist agrobiology, particularly the editors of the *Botaničeskij Žurnal* [*Botanical Journal*] and *Bjulletenj Moskovskogo Obščestva Ispytatelej Prirody* [*Bulletin of the Moscow Society of Naturalists*] are called to account; exception is taken to the inclusion of N. K. Kol'cov and N. P. Dubinin among the outstanding Soviet scientists in one recent article [cf. 91] and to what is referred to as its "unfounded criticism" of techniques such as vernalization, vegetative hybrids and intravarietal hybridization. Vernalization has, it is stated, accelerated the germination of spring crops in the Ukraine, North Caucasus and Volga Basin by 4–5 days; in some cases however improved cultural techniques have made vernalization unnecessary. Intravarietal crossing is also said to be still widely applied, as are Lysenko's organic-mineral manures and crossing of low-fat with high-fat cows; the loss from square planting of forest trees referred to by V. Koldanov [cf. 754] is ascribed to faulty application of the method, which, it is conceded, is not suitable for all conditions.

Reference is also made to the Order of Lenin which has recently been conferred on Lysenko.

1214 Stefanov, B.
(Some instances of probable conversion by leap-like variation).
Izv. Inst. Gorata (News Inst. For.)/Bull. Inst. For., Sofija 1958 : **3** : 345–58. [Bulgarian].

The occurrence among a population of *Bromus inermis* var. *aristatus* of forms belonging to var. *estolonosus* is reported from Bulgaria; the new form is thought to have arisen by conversion from the old. Other evolutionary changes by conversion reported include *Festuca myuros* → *F. dertonensis*, *Lotus corniculatus* → *L. angustissimus*, *Vicia cracca* → *V. gerardii* and *Veronica chamaedrys* → *V. chamaedrys* var. *nana*.

CYTOLOGY

CASPERSSON, T.
Reports from the First Swedish Conference on Cell Research, 1957).
Ark. Zool. 1958 : **11** : 105–31.

1215 *Bosemark, N. O. Terminal neo-centromeres in* Phleum nodosum. *(pp. 106–07).*

In studies of meiosis in plants of *Ph. nodosum* ($2n = 14$), neocentric activity, in which the chromosome ends were attenuated and directed towards the poles, could be observed in rod bivalents, ring bivalents and univalents at metaphase I and in undivided chromosomes at metaphase II. In the latter case, the ends might be directed towards different poles so that at anaphase, as the chromosomes moved towards the poles with the ends leading, fragmentation and bridge formation took place. No neocentric activity was seen in root tips, leaf meristems, tapetal cells or first pollen mitosis. It is thought that neocentric behaviour may be associated with the presence of large terminal chromosome knobs in this species.

1216 *Kihlman, B. A. Oxygen, cyanide and structural chromosome changes. (pp. 116–17).*

In a study of the influence of KCN upon the root-tip chromosomes of *Vicia faba*, the oxygen dependence of the radiomimetic effect of KCN was confirmed [cf. XXVI, 1995]. The oxygen effect was independent of oxidative phosphorylation, unlike the oxygen effects in the cases of 8-ethoxycaffeine and maleic hydrazide. No evidence that H_2O_2 was the active substance was obtained. Anaerobic X-ray treatment in the presence of KCN was as effective as aerobic treatment with the same dose in the absence of this salt.

Cupferron resembled KCN in its effect on anaerobic X-ray breakage. The activities of the enzymes catalase and peroxidase were not influenced by cupferron. "It is suggested that a heavy metal, presumably iron, occurs as a part of an oxidation-reduction system within the chromosomes. The formation of complexes between this metal and KCN or cupferron could account for the increase of anaerobic X-ray breakage and probably also for the radiomimetic effect of these chemicals. The iron-cyanide complex in question is believed to be more stable when the metal is in the ferric form than when it is in the ferrous form, a fact which would explain why the cyanide is more effective as a radiomimetic agent in the presence than in the absence of oxygen. The hypothesis may also provide an alternative explanation to the oxygen effect in connexion with X-ray breakage."

1217 *Knaben, G. On structural chromosome changes and evolution in* Papaver radicatum. *(pp. 118–19).*

The section *Scapiflora* comprises a polyploid series with 14, 28, 42, 56, 70 and 84 chromosomes. In studies of plants with 56 and 70 chromosomes, it has been shown that morphological differentiation is associated with chromosomal differentiation and that artificial crosses between isolates from different regions are structural hybrids. In southern Norway, isolates from a single mountain area give structural hybrids in which only 1–4 of the chromosomes differ, while in crosses between isolates from different regions 10–12 chromosomes are found to show structural changes, suggesting that chromosomal differentiation is continually taking place.

1218 *Lima de Faria, A. The structure and organization of some chromosomes. (p. 120).*

The same type of chromosome organization found in rye and *Agapanthus* is found in *Trillium* [cf. XXV, 1941].

1219 *Rosen, G. von. On the effect of metal ions on the plant cell. (p. 126).*

The effect of the concurrent action of two or more metal ions upon root-tip cells of *Pisum* and *Allium* was studied. The tendency of a metal cation to become a part of a complex ion, and hence its ability to participate in molecular and chelate formation, is a determining factor in its cytological reactivity, which is proportional to the magnitude of the stability constant of the chelate formed. With the method used, it was found that "for strongly complex-disposed bivalent metal ions when the maximal chromosome disturbance is attained, the concentration of metal ions as nitrate salt in the applied solution lies at pM = 2–3 (pM = ± log (Me^{++}), (Me^{++}) is the concentration in mol/liter), while for EDTA-bound metals pM = 12–15. The difference may be due to differences in the ability of the roots to take up metals as (Me^{++}) and Me-chelate. The low concentration of (Me^{++}) in MeEDTA probably exposes, however, the essential position of the *true* concentration value of the plasma and chromosome-breakdown reactivity of a strongly complex-forming metal."

1220 *Östergren, G. The course of meiosis in a case of abnormally prolonged chromatid pairing. (p. 130).*

The occurrence of prolonged chromatid pairing continuing from metaphase I to metaphase or telophase II, anaphase I and sometimes anaphase II being omitted, is described for the variety L'Innocence of *Narcissus poeticus* x *N. tazetta* ($2n = 17$). The result of the second division is often a monad and at pollen mitosis the double unreduced chromosome number $n = 34$ may be found.

1221 Milovidov, P.
Bohumil Němec.
Protoplasma 1958 : **50** : 181–84.

This brief survey of the activities of Němec of Czechoslovakia includes a mention of his special interests in experimental cytology.

1222 Breslavec, L. P.
(Radiosensitivity of cell organelles).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1958 : No. **3** : 282–90. [Russian].

The radiosensitivity of the structure elements and organelles of the cell was found to depend on the kind of organ in which they were located. The nucleus was the most sensitive in dividing or free cells, but not necessarily more than the plastids or mitochondria in the cells of resting tissues.

1223 Mather, K. & Jinks, J. I.
Cytoplasm in sexual reproduction.
Nature, Lond. 1958 : **182** : 1188–90.

Repeated conidial propagation in *Aspergillus glaucus* leads to loss of capacity for ascospore production. Similarly, propagation by means of hyphal tips results in a loss first of sexuality and then of conidial reproductive capacity. In both cases, however, a single propagation from even the last ascospore to be produced results in the complete restoration of sexuality, and in the second case conidial propagation at any stage will give progeny with partially restored ability to reproduce by conidia. It is suggested that while vegetative reproduction, particularly through hyphae, leads to cytoplasmic differentiation, restandardization of the cytoplasm occurs during sexual reproduction, and to a lesser extent during conidial reproduction. Thus the conidial progeny of a homocaryon is more variable in growth rate than the sexual progeny, and such cytoplasmic adaptations as tolerance of mercuric chloride are transmitted regularly through the hyphae, less so through the conidia and not at all through ascospores.

1224 Galinsky, I.
The occurrence of dumbbell-shaped nuclei.
J. Franklin Inst. 1956 : **262** : No. **1** : 81–84.

Dumbbell-shaped nuclei may be explained as resulting from: (*a*) the presence of chromosome bridges; (*b*) nuclear fusion; or (*c*) failure of spindle formation. The first and last are regarded as the chief causes.

1225 Kaufmann, B. P. & Gay, H.
The nuclear membrane as an intermediary in gene-controlled reactions.
Nucleus, Calcutta 1958 : **1** : No. **1** : 57–74.

This discussion, which is largely of a speculative nature, is based on the results of recent studies of *Drosophila* [cf. XXVII, 3651]. The topics considered include the possible role of polyteny, protein synthesis in the cell, the origin of plasmagenes and possible coordinating properties of the nuclear membrane in gene controlled reactions.

1226 Konarev, V. G., Zakirov, S. Z. & Elsakova, T. N.
(The affinity for pyronin of the nucleus as an index of the state of its deoxyribonucleic acid.)
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **120** : 409–11. [Russian].

Various plant materials, fixed in the usual manner, were treated with N HCl at 20° C. before staining with methylene green and pyronin, using the method of Trevan and Sharrock, to ascertain the degree of polymerization of the DNA and its connexion with protein.

1227 Lafontaine, J. G.
Structure and mode of formation of the nucleolus in meristematic cells of *Vicia faba* and *Allium cepa*.
J. biophys. biochem. Cyt. 1958 : **4** : 777–84.

Electron-microscopic examination of interphase nucleoli in *V. faba* and *A. cepa* revealed that they are roughly classifiable into two categories: (1) those exhibiting a fairly homogeneous structure and frequently containing dense particles 140 Å. in diameter, and (2) those characterized by a very sharp boundary between a dense outer cortex and much lighter central core. The second type occurs more frequently in *V. faba* and in this species is without dense particles. In *A. cepa* the boundary is more irregular and dense particles may sometimes be observed in the outer layer. Many nucleoli show a structure intermediate between the two types and are characterized by a gradient of increasing density from the centre to the periphery and occasionally contain dense 140 Å. granules. In *A. cepa* the particles are first observed in loose clusters between the arms of late-anaphase chromosomes, where they undergo numerical increase during early telophase. The substance within which the granules are scattered slowly increases in density. It seems that the granules coalesce into small prenucleolar bodies which fuse during telophase to give rise to the mature interphase nucleoli. In *V. faba* the prenucleolar substance first appears as a thin layer of dense material between the telophase chromosomes, prior to the formation of prenucleolar bodies. During interphase, the nucleoli are in some cases closely associated with segments of chromatin strands which are regarded as representing nucleolar-organizing regions.

1228 FOSTER, T. S. & STERN, H.
Soluble deoxyribosidic compounds in relation to duplication of deoxyribonucleic acid.
Science 1958 : **128** : 653–54.

Assays of anthers of *Lilium longiflorum* revealed three outstanding peaks in concentration of deoxyribosidic compounds during anther development. The peaks corresponded with the three periods of DNA synthesis known to occur, viz. prior to meiosis and tapetal mitosis, prior to meiosis II and during pollen maturation. Two properties of each peak are distinctive: the concentration is some 25 times that of the basic concentration, and the duration of the high concentrations is of the same order as that of DNA synthesis. It may therefore be inferred that DNA is formed from soluble deoxyribosidic compounds and that the sequence of reactions leading to DNA duplication begins with an abrupt activation of enzymes metabolizing these compounds. Whether the accumulation of deoxyribosidic compounds is of itself sufficient to initiate polymerization or whether the two processes are activated separately remains to be discovered from enzymatic studies.

1229 ALLFREY, V. G. & MIRSKY, A. E.
Some effects of substituting the deoxyribonucleic acid of isolated nuclei with other polyelectrolytes.
Proc. nat. Acad. Sci. USA 1958 : **44** : 981–91.

Up to 75% of the DNA of isolated nuclei of calf thymus was removable by the action of pancreatic DNase. Nuclei so depleted lost the capacity for synthesis of adenosine triphosphate, aminoacid incorporation into protein and adenosine uptake into RNA. If polyanions (DNase, RNase, polyadenylic acid and non-nucleotides such as polyethylene sulphonate, heparin and chondroitin sulphate) were present at the time of DNA removal, over two-thirds of the DNA could be substituted without any apparent loss in biochemical activity of the nucleus, but polycations, such as protamine or protolysine, failed to maintain functional capacity. These findings suggest a correlation between negative charge and biochemical activity of the chromosomes. If this hypothesis receives support in further investigations, it may be possible to demonstrate that one role of the basic proteins (histones and protamines) is to reduce or control the function of the chromosomes by masking the negative charges of the DNA.

1230 BHATTACHARJYA, S. S.
Die Wirkung von Röntgenstrahlen auf Kerne mit verschiedener heterochromatischer Konstitution. **(The action of X rays on nuclei with different heterochromatic constitution).**
Chromosoma 1958 : **9** : 305–18.

Pollen mother cells of *Impatiens sultani* showed slightly more chromosome aberrations after X irradiation than pollen mother cells of *I. balsamina*. Nuclei of both species had about the same amount of heterochromatin but they differed in its distribution. Each chromosome of *I. balsamina* had a central block of heterochromatin, whereas in *I. sultani* the heterochromatin was distributed in several pieces over the chromosomes. It is suggested that neighbouring euchromatin may influence the sensitivity of heterochromatin to X rays; in *I. sultani* such an effect would be greater than in *I. balsamina*. It is not known whether the greater number of aberrations in *I. sultani* was due to an increased tendency for the chromosomes to break or to a lowering in their capacity to reform after breaking. Primary effects of X irradiation such as clumping were also greater in *I. sultani*.

1231 ZUBAY, G.
A template model for the synthesis of ribonucleic acid from deoxyribonucleic acid.
Nature, Lond. 1958 : **182** : 1290–92.

The scheme proposed earlier [123], in which nuclear RNA is synthesized on a double helical DNA template with each base pair providing a specific site for a nucleotide of RNA, requires that the binding between the RNA nucleotide and the template site is energetically favourable and that at the same time the reactive groups of the monomer are in a position to condense on the growing end of the polymer. These requirements cannot be satisfied unless the DNA is so modified that (1) the hydrogen bonds between the amino group and the carbonyl group in both base pairs are broken, (2) the planes of the bases are twisted relative to each other, and (3), in some cases, the adenine and cytosine amino groups are rotated out of the plane of the base. From a model, the positions of the components of the DNA base pairs on either chain I or chain II, to give the respective RNA nucleotides, are deduced, and it is confirmed that a three-stranded helical molecule could be an intermediate complex in the synthesis of nuclear RNA. Studies conducted so far show that in the model each of the four RNA nucleotides may be substituted by another, suggesting that the template may lack specificity.

1232 Kellenberger, E., Ryter, A. & Séchaud, J.
Electron microscope study of DNA-containing plasms. II. Vegetative and mature phage DNA as compared with normal bacterial nucleoids in different physiological states.
J. biophys. biochem. Cyt. 1958 : **4** : 671–78.

The nucleoids of *Escherichia coli*, irrespective of the physiological states of the bacteria, have been found to be preserved as fine-stranded fibrillar nucleoplasms by an OsO_4 fixation procedure. By means of the same procedure, the DNA of vegetative phage has been shown to consist of a pool of homogeneous fibrillar material very similar to the nucleoplasm. Versene caused coagulation of both the nucleoplasm and DNA pool, further evidence of this close structural resemblance thus being obtained. It is postulated that the genetic material of bacteria may multiply by the same process as phage, the nucleoid being a pool containing one or several bacterial genomes in a form similar to vegetative phage. In order to explain the genetic continuity of the bacteria, together with the fact that during division only less than 1% abnormal and nonviable cells are produced, it is necessary to assume the existence either of only one linkage group or, when more linkage groups are present, of a high number of identical strands. Polyteny is easier to reconcile with continuous synthesis of DNA, some of the complicated patterns of segregation in the progeny of conjugated bacteria and the delay in appearance of phenotype in the case of some mutations. Division of a nucleoid would be a random separation into two daughter nucleoids, each containing at least one complete genome. Irradiation data appear at first sight to provide evidence against the possibility of polyteny, since survival curves are chiefly of the one-hit type and most simply explained on the basis of one sensitive target. Similarity to the behaviour of the phage pool, however, gives a contrary indication; this pool also behaves as one unit, even when it contains as many as 20–40 phage equivalents of DNA; the survival of phage production after X irradiation or decay of integrated P^{32} also presents a curve of the one-hit type. The proposed hypothesis of the division of the bacterial nucleoid could be extended to the division of the chromosomes in higher organisms, the nucleoid being regarded as a single multistranded chromosome. "The main difference between chromosomes would lie in their organization and the moiety which is not DNA." The high water content and consequently low density of the bacterial nucleoids may be explained by absence of protein and perhaps also by absence of supercoiling.

1233 Savage, R. E. & Plaut, W.
The effect of HCl hydrolysis on the retention of thymidine in DNA.
J. biophys. biochem. Cyt. 1958 : **4** : 701–06.

Woods has recently suggested that the acid hydrolysis optional for Feulgen staining of DNA results in loss of nearly two-thirds of the DNA [cf. XXVIII, 3743]. In his investigations, anthers of *Lilium longiflorum* were frozen and dehydrated, fixed in hot 75% alcohol and hydrolysed with 10% perchloric acid at 20° C. for periods ranging from 15 min. to 144 hr., the liberation of thymine into the hydrolysates being taken as the criterion of DNA loss. The authors have reinvestigated the problem under the standard conditions of the Feulgen procedure. *Allium* roots grown in C^{14}-thymidine and H^3-thymidine media were treated with N HCl for 0–20 min. at 60° C. and the retention of the radioactive thymidine in DNA as a function of hydrolysis time was determined autoradiographically. No significant loss of label was detected until hydrolysis was extended beyond the optimum time for Feulgen staining. The data are consistent with the assumption that there is no significant loss of DNA during normal Feulgen hydrolysis in the material used. Various factors which may be responsible for the discrepancies between the results obtained by Woods and the authors are discussed.

1234 Sharma, A. K. & Sharma, A.
Recent advances in the study of chromosome structure.
Bot. Rev. 1958 : **24** : 511–49.

A detailed survey of recent literature on the physical and chemical nature of chromosomes and of the chemical structure of genes is presented.

1235 Bradley, S. G.

Genetic analysis of segregants from heterokaryons of *Streptomyces coelicolor.*

J. Bact. 1958 : **76** : 464–70.

Heterocaryons of *S. coelicolor*, formed by the interaction of complementary auxotrophs, were found to be stable and most of the few segregants isolated resembled one of the parental types. In rare cases nonparental auxotrophic segregants were isolated, either with at least one nutritional requirement of each parent or with a new requirement. In the first case the parental genomes were present but not balanced. It is suggested that the new requirements arose by mutation rather than by recombination.

1236 Galinsky, I.

Difference in response of animal and plant cells to mitotic poisons.

J. Franklin Inst. 1956 : **262** : No. 2 : 155–56.

C-mitoses in animal cells are generally distinguished from those in plant cells in that in the former, division of the centromere fails and the cell passes directly into c-telophase after c-metaphase. Occasionally, however, c-mitosis of the plant type may occur in animal cells and *vice versa*. Treatment of onion root-tips with sodium and potassium phosphates at high concentrations inhibited centromere division while low concentrations induced the normal plant-type of c-mitosis. It is concluded that the centromere is more easily prevented from dividing in animal than in plant cells.

1237 Taylor, J. H.

Sister chromatid exchanges in tritium-labeled chromosomes.

Genetics 1958 : **43** : 515–29.

"By following the distribution of tritium-labeled DNA in chromosomes of Bellevalia, they are shown to be two-stranded before duplication. Both chromatids of each chromosome are labeled at the first metaphase or anaphase after incorporation of tritium-labeled thymidine. After another duplication in the absence of labeled precursors each labeled chromatid (chromosome now) yields one labeled daughter and one free of label at any level along the length. Sister chromatid exchanges were frequent, but half-chromatid exchanges, i.e., exchanges between one strand in each of two chromatids, were not observed. Sister chromatid exchanges were frequently observed to occur as pairs or twins, i.e., exchanges occur at the same locus in two of the four homologous chromosomes in the second c-metaphase after labeling. Among 204 second metaphase chromosomes examined there were 81 twin exchanges and 30 single exchanges. This frequency can be explained only on the hypothesis that the two strands of the chromosome are unlike, i.e., are not free to reunite at random. Therefore, the chromosome has two features in common with the Watson-Crick model of DNA. It has two strands and the strands are different in some structural feature that restricts reunion to like strands when chromatid exchanges occur." [Cf. XXVII, 2508]. [Author's summary].

1238 Gamow, G.

Possible mathematical relation between deoxyribonucleic acid and proteins.

K. danske videnskab. Selsk. : Ser. Biol. Medd. 1954 : **22** : No. 3 : 3–13.

A theory referred to earlier [XXIV, 1592] is described in greater detail. The different aminoacids constituting proteins are regarded as fitting into the rhomboidal interstices between the nucleotides on the concave side of the helical DNA molecule in the Watson-Crick model. The possibilities of establishing an exact correspondence between the aminoacids and the interstices are considered. For insulin, the correspondence was not exact, possibly because of oversimplification of the theory or because insulin is not a protein whose structure is directly and completely determined by the genes in the chromosomes.

1239 Gamow, G.

On information transfer from nucleic acids to proteins.

K. danske videnskab. Selsk. : Ser. Biol. Medd. 1955 : **22** : No. 8 : 3–7.

On the assumption that each aminoacid in the protein structure is determined by a triplet of bases in the RNA chain, it may be expected that the relative abundance of different aminoacids will be given by the products of the relative abundances of the three corresponding bases. A good agreement is found between the calculated abundances of the various triplets and the observed abundances of the different aminoacids in tobacco mosaic virus. If this agreement is not coincidental, it should permit the establishment of a correlation between individual units forming polynucleotide and polypeptide chains.

1240 Giesbrecht, P.

Zur Struktur des Bakterienzellkerns. **(The structure of the nucleus of the bacterial cell).**

Naturwissenschaften 1958 : **45** : 473–74.

The nucleus of *Bacterium megaterium* appeared to contain a single chromosome, which in some nondividing cells consisted of two chromatids. The chromosome was a spiral of up to five turns; unravelling of the spiral occurred during cell division. Spirally arranged structures of macromolecular size appeared to make up the chromosome, which greatly resembled chromosomes of the dinoflagellate *Amphidinium elegans*.

1241 LIMA-DE-FARIA, A. & SARVELLA, P.
The organization of telomeres in species of *Solanum*, *Salvia*, *Scilla*, *Secale*, *Agapanthus* and *Ornithogalum*.
Hereditas, Lund 1958 : **44** : 337–46.

Meiotic investigation of *Lycopersicon esculentum*, *Salvia viridis*, *Scilla sibirica*, *A. umbellatus*, *O. virens* and *Secale cereale* showed the chromosome end to be typically divisible into two regions: a terminal deeply-staining protelomere and an adjacent weakly-staining eutelomere. The eutelomere is well-defined distally but may not be so proximally. As a rule, the protelomere consists of one to three large chromomeres and also fibrils while the eutelomere is made up of one or two minute chromomeres and thin and highly transparent fibrils. Terminal deficiencies involving part or the whole of the protelomere were detected at pachytene in the tomato. The right end of chromosome IV in rye was deficient with respect to a segment of the protelomere and a segment of the eutelomere. Analysis of the individual chromosomes of tomato, *S. viridis* and rye showed that the arms having a deviating chromomere pattern, apart from the above-mentioned deficiencies, are only those which are either associated with the nucleolus or are part of B chromosomes. The standard B chromosome of rye has two types of telomeres: primary and secondary.

1242 KOSTRJUKOVA, K. JU.
(Modern data on the modes of development of the cell).
Ukrajin. bot. Ž. 1958 : **15** : No. 3 :90–97. [Ukrainian].

The concepts of mitosis as (1) a division of the mother cell into two identical daughter cells and (2) a *de novo* formation of a new cell from the old one are examined, the writer putting forward several arguments in favour of the latter hypothesis.

1243 FAGERLIND, F.
Changes in construction and position of chromosomes during the different phases of mitosis and meiosis.
Hereditas, Lund 1958 : **44** : 495–515.

Based chiefly on investigations on *Tradescantia*, *Lilium* and *Rosa*, and condensed as a summary of 97 items, a preliminary account is given of the author's views on mitosis and meiosis, emphasis being laid on the spiralization conditions of the chromosome and its subunits and on the interpretation of nuclear division in terms of an electrostatic system.

1244 BAJER, A.
Cine-micrographic studies on chromosome movements in β-irradiated cells.
Chromosoma 1958 : **9** : 320–31.

Endosperm of *Haemanthus katharinae* was used in these studies; the development of the mitotic spindle appeared to be normal in irradiated cells. An account is presented of the movements of chromosomes and fragments during mitosis; five groups of forces influencing these movements were distinguished.

1245 TORREY, J. G.
Differential mitotic response of diploid and polyploid nuclei to auxin and kinetin treatment.
Science 1958 : **128** : p. 1148. (Abst.).

In investigations on excised segments of mature pea-root tissue, a yeast extract - auxin medium stimulated mitosis in 4*n* cells, mitotic figures being only infrequently observed in 2*n* nuclei and nuclei with a higher degree of polyploidy than 4*n*. On a synthetic medium containing the auxin but vitamins and organic sources of N instead of yeast extract, mitosis was only seen in 2*n* cells. Further work was therefore carried out to determine the factors in the first medium which were responsible for stimulating division in 4*n* cells. Addition of yeast nucleic acid and purines and pyrimidines to the synthetic medium was ineffective in inducing mitosis in 4*n* cells, but with the addition of kinetin at a concentration of 5 x 10^{-6} M mitosis occurred frequently in 4*n* cells.

1246 FUJII, T.
Observations on the behavior of zinc during mitosis in fresh staminal hair cells of Tradescantia.
J. Fac. Sci. Tokyo Univ. : Sect. 4. Zool. : 1955 : **7** : 327–34.

Treatment of living cells with alcoholic dithizone, which gives a purple coloration in the presence of zinc, resulted in purple staining of the nucleoli in resting and early prophase cells and of the chromosomes at metaphase and anaphase. During telophase the purple reaction faded except in chromosomes to which nucleolus-like bodies were attached, suggesting that dithizone-positive substances pass from the chromosomes into the nucleoli.

1247 ÖSTERGREN, G. & BAJER, A.
Permanent preparations from endosperm cells flattened in the living state.
Hereditas, Lund 1958 : **44** : 466–70.

As already shown, endosperm offers useful material for studying chromosome behaviour *in vivo*, since the absence of cellulose walls makes it possible to flatten the cells gradually by the action of surface tension [cf. XXV, 58]. The authors give details of a technique of fixing and staining endosperm cells of *Haemanthus katherinae* which had been flattened in the living condition.

1248 MAKINEN, Y.
The effect of acetic acid and hydrogen peroxide on mitotic frequency in *Allium cepa*.
Nucleus, Calcutta 1958 : **1** : No. 1 : 131–52.

Roots of *A. cepa* were treated with 0·001 M and 0·0001 M solutions of acetic acid and hydrogen peroxide; various periods of treatment and recovery were used. In general, treatment with each compound resulted in a decrease in the frequency of mitosis. Both compounds caused an increase in the ratio of metaphases to prophases; this phenomenon is explained with reference to precocious spindle formation.

1249 QUENETTE, R.
Action de l'aminoptérine sur les méristèmes radiculaires d'oignon, de lin et d'orge. **(Action of aminopterin on the root meristems of onion, flax and barley).**
Rev. Cytol. Biol. végét., Paris 1958 : **19** : 199–21.

The three experimental plants reacted similarly. At higher concentrations, irreversible inhibition of mitosis occurred, such that after eight hours a diminished number of prophase cells were seen and none showing later phases of division. The threshold concentration for inhibition lay between 10^{-8} and 10^{-9}.

1250 TSCHISCHOW, N. T. DE
Alteraciones morfológicas en los cromosomas de *Vicia faba* y *Pisum sativum*, provocadas por la eserina, salicilato de eserina, ácido salicilico y salicilato de sodio. **(Morphologic chromosome alterations in *V. faba* and *P. sativum* induced by eserine, eserine salicylate, salicylic acid and sodium salicylate).**
Bol. Soc. Biol. Concepción 1954 : No. 29 : 7–17.

Treatment of seeds of *V. faba* and *P. sativum* with various doses of eserine salicylate resulted in shortening and agglutination of the chromosomes in root-tip cells and disappearance of the spindle. The presence of two or more nuclei was frequently observed, and cells fixed some days after treatment were sometimes tetraploid. Treatments with sodium salicylate and eserine were similar in effect, except that with the latter no tetraploid divisions were found. With salicylic acid, mitosis was normal but at a later stage polyploid divisions were seen. It is concluded that eserine resembles colchicine in effect while salicylates stimulate division in tetraploid cells.

1251 WILSON, G. B. & MORRISON, J. H.
Mitotic activity and behaviour as an index of chemical effect.
Nucleus, Calcutta 1958 : **1** : No. 1 : 45–46.

In studies on the effects of chemicals on mitosis, the pea seedling has been extensively used at Michigan State University. In connexion with this work, the mitotic cycle of the pea is discussed. Six stages of prophase are recognized by reference to a set of photographic standards. Mitosis appears to depend essentially on a series of changes in the properties of the nuclear membrane, the development and organization of spindle material and cleavage of the cinetochore. An antimitotic is defined "as any substance which interferes with any, or all, of the processes essential for completion of mitosis providing that the concentration is within the physiological range and that the effect is reversible at some detectable level."

A hypothetical model of mitosis based on the fact that, if the movement cycle is interrupted, chromosome condensation and telomorphic transformation continue, is used to set up mathematical relationships between the mitotic stages; the direction, degree and rate of change in such relationships can be used to measure with some precision the effect of any treatment, as compared with suitable controls. This approach has been used to measure the effects of colchicine and actidione [cf. XXVIII, 3727]. Many chemicals with cytological action similar to that of actidione have been referred to as spindle poisons. In this connexion, it is pointed out that after treatment with effective doses of actidione, the chromosomes do not reach a stage in the movement cycle which corresponds to the formation of an organized spindle. Spindle organization may be dependent in part on chromosome position.

There are a number of ways in which the spindle could be poisoned. Supposing a certain type and distribution of protein are necessary for the formation of a functional spindle, any interference with these processes would affect spindle formation. Therefore similar cytological effects could be produced by a wide range of chemical substances.

Substituted phenols and particularly those related to 2,4-D are often said to produce a colchicine-type reaction. It has now been found that treatment with a variety of substituted phenols results in the appearance of certain configurations considered to be diagnostic for colchicine [cf. XXVIII, 3727]; the configurations also appear in the same order as with colchicine. The dose-effect relationship is also similar but there is always a definite inhibition of the onset of mitosis, the colchicine type of reaction never being completed. It is considered of importance to determine whether the inhibition effect, which appears to be irreversible at low dose levels, can be separated from the colchicine effect. If an organism could overcome the toxic effect but not the c-mitotic one, it would very probably develop at least patches of polyploid tissue.

Studies of reactions to monoiodoacetic acid are now in progress. This chemical was found to cause marked inhibition of the movement of chromosomes from one stage to another, as shown by the gradual appearance of telomorphic configurations. All transition stages including the onset of mitotic activity are inhibited; the effect is dependent on the dose. Some transitions appear to be more readily inhibited than others. Failure of cinetochore cleavage rather than impairment of the spindle *per se* seems to be responsible for the prevention of chromosome movement. It is concluded that monoiodoacetic acid interferes with the supply of energy for mitosis. This substance is known to inhibit glycolysis; it therefore seems probable that glycolysis is associated with mitosis, this view being supported by evidence from various sources. Another inhibitor of glycolysis, KF, produced a gradual and rather uniform drop in mitotic activity. The different results obtained with the two inhibitors could be explained by reference to the mechanism of their action.

1252 Schreiber, R. W. & Duncan, R. E.
A cytological analysis of the antimetabolite activity of 5-hydroxyuracil in *Vicia faba* roots.
J. biophys. biochem. Cyt. 1958 : **4** : 793–806.

A detailed account is given of investigations which have already been briefly reported XXVIII, 78].

1253 Wada, B. & Fukunaga, K.
A new technique to demonstrate the surface membrane of the spindle in preparations.
Cytologia, Tokyo 1957 : **22** : 442–51.

By means of a coagulation technique involving treatment with solutions of metallic salts, the surface membrane and fibrillar structures of the spindle have been differentiated in *Tradescantia*, *Hosta* and the grasshopper *Atractomorpha bedeli*.

1254 Shaw, G. W.
Adhesion loci in the differentiated heterochromatin of *Trillium* species.
Chromosoma 1958 : **9** : 292–304.

The adhesion loci described are specific points on the heterochromatic segments where the chromosomes stick together at anaphase after cold treatment. These adhesions are constant in position and have been found in some *Trillium* species but not in others; moreover this phenomenon is confined to certain plants within a species. It is suggested that adhesions may be due to subchromatid breakage followed by partial inverted reunion, the reunion being under the control of the centromere.

1255 Steffensen, D.
Chromosome aberrations in calcium-deficient *Tradescantia* produced by irradiation.
Nature, Lond. 1958 : **182** : 1750–51.

Increased sensitivity to induced breakage in Ca-deficient plants was expressed in the absence or presence of oxygen [cf. XXVIII, 1204]. An experiment with X rays and sparsely ionizing γ rays indicated that lowering of the Ca concentration in the nutrient culture enhanced sensitivity to radiation by increasing the probability of breakage by fewer ionizations.

1256 Kihlman, B. A.
Respiration and radiosensitivity of broad bean roots.
Nature, Lond. 1958 : **182** : 730–31.

In the presence of the respiratory inhibitor cupferron, 1·3 μmol./l. oxygen was sufficient to increase the radiosensitivity of broad bean roots, as determined from the number of isolocus breaks and exchanges per 100 cells induced by 100 r. X rays. At 3·9 μmol./l. oxygen, radiosensitivity was more than doubled and maximum sensitivity appeared to be reached at 36 μmol./l. In the absence of cupferron, sensitivity was not significantly increased at less than 65 μmol/l. oxygen, and even at high oxygen concentrations was appreciably less than in the presence of cupferron.

1257 NEARY, G. J. & EVANS, H. J.
Chromatid breakage by irradiation and the oxygen effect.
Nature, Lond. 1958 : **182** : 890–91.

Chromatid aberration frequency at different γ-ray doses in the presence and absence of oxygen was determined in *Vicia faba* root-tip cells. While the presence of oxygen increased the frequency of aberration, the dose exponents in air and in nitrogen were similar. The nitrogen : air ratio of the doses required to produce the same aberration frequency could thus be simply determined and was approximately 2·5 for each of the aberration types, chromatid breaks, isochromatid breaks and chromatid interchanges, with a slightly but not significantly lower value for achromatic lesions. Numbers of isochromatid and interchange aberrations in which the ends remained unjoined did not differ significantly in air and nitrogen, indicating that oxygen affects breakage rather than rejoining. However, the low frequency of true chromatid breaks and the absence of isochromatid aberrations showing no reunion are more in accordance with the exchange mechanism for aberration production, as proposed by Revell.

1258 DELONE, N. L.
(The combined effect of ethylenediamine tetraacetic acid and X-irradiation upon microspores of *Tradescantia paludosa* at interphase).
Dokl. Akad. Nauk SSR (Proc. Acad. Sci. USSR) 1958 : **119** : No. 4 : 800–02. [Russian].

Chromosome fragmentation and the formation of acentric and centric rings and dicentric chromosomes were observed in the microspores of *T. paludosa* subjected to X-rays alone or to combined treatment with the above two agents. The percentage of chromosomes affected by the latter treatment was higher and, in addition, it gave rise to chromatid aberrations. Chromosome inversions and translocations occurred in both treatments.

1259 TAKATS, S. T.
Chromatin extrusion during microsporogenesis.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–835 : p. 766. (Abst.).

Using *Allium cepa* or *Lilium longiflorum*, the following results were obtained. (1) No evidence that the tapetum contributed to the extranuclear chromatin was found. (2) In frequency, extruding microsporocytes increased from very early zygotene to a maximum at the end of zygotene and decreased abruptly at pachytene. The maximum proportion of cells showing extrusion in a single anther was usually less than one-fifth. Variation in frequency of extrusion was considerable both between anthers of a single bud and within sets of locules. In each locule, the distribution of extruding cells shifted with time from the tip to the base. (3) Extrusion did not result in degeneration of the affected cells. (4) Wounding of the anthers by cutting or puncturing brought about an increase in frequency of extrusion at the same stage at which extrusion occurred in intact cells. (5) Fixatives could be distinguished according to their effects on extrusion in intact anthers. Extruding cells were present after fixation with acid-alcohol, formaldehyde or osmium but were not typical in the case of the two last-mentioned fixatives. Data from *Lilium* indicated that frequency of extrusion may depend on the concentration gradient of the fixing fluid (Carnoy) as it penetrates the sporogenous tissue.

1260 TUŠNJAKOVA, M. M.
(The role of the temperature factor during X irradiation).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 265–72. [Russian].

Seeds of oats and chickpea were subjected to temperatures around zero (1) before and (2) after treatment with various doses of X irradiation. Germination was not noticeably altered in treatment (1) and in oats growth was stimulated but reproduction disrupted. The deleterious effects of irradiation were intensified in treatment (2) which caused extensive chromosome fragmentation and lethality.

1261 CELESTRE, M.-R.
Influenza di un campo magnetico alternativo su antere di *Allium cepa* L. **(Influence of an alternating magnetic field on the anthers of *A. cepa* L.).**
Ann. Sper. agr. 1958 : **12** : 1335–49.

Meiotic aberrations have been induced in the anthers after treatment by a magnetic field of 1150 gauss alternating at 50 cycles/sec. The aberrations included chromosome fragmentation, duplicate spindles, multipolar spindles and micronuclei.

1262 SATO, S.
(Chromosome aberrations induced by chemical substances).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 34–36 : 1232–45. [Japanese].

This detailed review of recent research is divided into three sections devoted respectively to chromosome contraction, stickiness and breakage induced by chemicals.

1263 MOLÈ-BAJER, J.
Cine-micrographic analysis of c-mitosis in endosperm.
Chromosoma 1958 : **9** : 332–58.

The course of colchicine-induced c-mitosis was compared with that of normal mitosis in *Haemanthus katharinae*, details being given of spindle development and chromosome movement.

1264 KATO, Y.
(Effects of gibberellin and fusarinic acid on mitosis).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 34–36 : 1220–24. [Japanese].

The effects of the above substances on mitotic cells in onion roots have been investigated and compared with the effect of indole-3-acetic acid. Gibberellin induced pseudochiasmata, sometimes resulting in chromosome breakage. Fusarinic acid induced a high frequency of c-mitoses, also polypolar spindles, reductional groupings, laggards and micronuclei.

1265 PAGET, G. E. & WALPOLE, A. L.
Some cytological effects of griseofulvin.
Nature, Lond. 1958 : **182** : 1320–21.

Effects observed after immersion of growing roots of *Vicia faba* in a supersaturated solution containing 20–40 μg./ml. griseofulvin for varying periods included delay of mitosis, induction of multipolar mitosis and segregation of the chromosomes after chromatid separation into irregular groups to form up to five nuclei of varying size within the original cell. Fewer polyploid nuclei were induced than would be expected with colchicine treatment. Effects in animal cells are also described.

1266 WOLFF, S. & LUIPPOLD, H. E.
Modification of chromosomal aberration yield by postirradiation treatment.
Genetics 1958 : **43** : 493–501.

After irradiation of *Tradescantia* microspores with X rays, respiration was inhibited by anoxia or carbon monoxide in the dark; this treatment prevented the rejoining of chromosome breaks so that they were able to interact with breaks induced by a second irradiation. More breaks were induced in the presence of oxygen than in its absence. Cellular respiration involving ATP seems to be necessary for the rejoining of chromosome breaks. The results with *Tradescantia* resemble those obtained with *Vicia* [cf. XXV, 1568 and XXVI, 66].

1267 COHN, N. S.
An analysis of the rejoining of X-ray-induced broken ends of chromosomes in the root tips of *Allium cepa*.
Genetics 1958 : **43** : 362–73.

Fractionated doses of X rays produced two kinds of breakage in root-tip chromosomes of *A. cepa*. One class of break underwent restitution within 15 min., whilst the other remained open for up to 4 hr. Carbon monoxide treatment produced a light-reversible inhibition of restitution of both kinds of breaks. The possibility of the breaks being of an ionic nature, with iron as the cation involved, is discussed.

1268 BARANOV, P. A.
[**Polyploidy.** (**The present position of the problem and the aims in research**)].
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1958 : No. 9 : 30–37. [Russian].

This article reviews the cytological, genetical, evolutionary, physiological and biochemical aspects of polyploidy research.

1269 FUNABIKI, K.
(Distribution and polyploidy in the angiosperms. I. Flora along the hinterland of the Sea of Japan).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 37–38 : 1253–67. [Japanese].

The incidence of polyploidy in the forest flora of the prefecture of Niigata was ascertained. The proportion of polyploid monocotyledons is approximately the same as in Central Europe but the proportion of polyploid dicotyledons (23·6%) is lower than that reported for any European region.

1270 FUNABIKI, K.
(Distribution and polyploidy in the angiosperms. II. Essential features with regard to northern Japan).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 37–38 : 1268–75. [Japanese].

The incidence of polyploidy was ascertained in floras from Ishikari in the island of Hokkaido and from the prefecture of Aomori. The percentage of polyploid dicotyledons is higher than in corresponding latitudes in Europe, being equivalent to a European latitude some 10° further south. The proportion of polyploid monocotyledons is 66·7% in Aomori and reaches the very high value of 89·5% in Hokkaido.

1271 POLJAKOV, I. M.
(The present state of the problem of selective fertilization in plants).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 177–86. [Russian].

A general review of research on selective fertilization in cereals, beets, cotton, tobacco and other self and cross pollinating plants is given.

1272 CODD, L. E.
Experimental techniques and plant taxonomy.
S. Afr. J. Sci. 1958 : **54** : 309–18.

The author discusses the status of classical taxonomy in relation to the cytogenetical and phytochemical approaches and to microevolutionary terminology, and advocates that systematic botanists should aim at establishing a broad morphological classification in which the finer details can be filled in by the findings of experimental taxonomists.

CROP PLANTS

1273 KEMMERER, J. B.
Breeding for mechanisation.
World Crops 1958 : **10** : 367–68.

After briefly commenting on some of the results achieved in the past by plant breeders the author describes some new requirements resultting from increasing mechanization. Two examples are discussed, the breeding of a bean variety suitable for mechanized harvesting and of a straight-rooted carrot giving less wastage when diced for soup. The methods used in breeding to overcome the problems involved are briefly described.

1274 HAYWARD, P. R.
Eighth & Ninth Reports on Trial and Experimental Work carried out at "Throws" Little Dunmow 1955/56 & 1956/57 : Pp. 48.

The results of trials of winter wheat, spring barley, forage grasses and legumes and winter beans are discussed.

Winter wheat. About 600 F_4 single plant selections from crosses among Petit Quin Quin, Eclipse, Holdfast, Nord Desprez and Benoist 40 were under observation in 1955–56 and some reselected lines from crosses involving Eclipse showed promise in respect of short straw and high yield and have red grain and chaff.

These lines showed further promise in the following year and are to be included in yield trials. Selection of true-breeding lines from the remainder of the crosses continued.

Broad bean. Further selection in 1955–56 for yielding ability and red seed colour [cf. XXVII, 1187] indicated that it is possible to isolate strains combining these characters and commercial-scale trials have given promising results. Marked reduction in pod setting was noted in 1956–57 when the plants were covered to prevent cross pollination. It has been observed that some "factors of plant type" appear to be associated with red seed colour and if this is confirmed rogueing of red-seeded lines will become possible.

Repeated trials of the six lines involved in the composite Throws MS have shown that four are markedly superior and future stocks will be based only on these lines. Single-plant progeny have been under observation in respect of winter hardiness, early establishment, tillering and freedom from virus mosaic but in spite of repeated reselection a considerable degree of variability still occurs.

1275 EVANS, G.
Conference on plant breeding.
Nature, Lond. 1958 : **182** : 843–44.

Papers read at the Eighth Plant Breeders' Conference held at the Welsh Plant Breeding Station, Aberystwyth, on 2–3 July, 1958, are reported. E. J. Lewis described how, using the diallel technique to assess the potential breeding value of an outbreeding species, perennial ryegrass, he found that increase in hay and aftermath production showed high average dominance uncomplicated by nonallelic interaction, indicating an absence of specific combining ability among the plants involved. This implies that improvement may be achieved by the accumulation of favourable dominant alleles, which is borne out by the relatively high degree of homozygosity for such alleles shown by improved strains.

In a paper on the genetics of production characters in ryegrass, J. P. Cooper emphasized the importance of three parameters: the amount of genetic variation available; its accuracy of measurement; and its heritability. In studies of heading, data for replicated clones showed little variation between blocks within one year, and high repeatability between years. Heritability was high and most of the genetic variation additive, but all plants were heterozygous for genes controlling date of heading, and a small group of plants of similar phenotype could carry much potential variation. Heritability also appeared to be high for leaf length and rate of leaf appearance but less so for rate of tillering. Appreciable additive genetic variation for these components was found in both Italian and perennial ryegrass strains. Most plants were highly heterozygous for genes governing these characters.

K. Jones reported that no appreciable chromosomal differentiation has been found between diploids ($2n = 14$) and tetraploids ($2n = 28$) of cocksfoot, or among different tetraploids. When triploids were crossed with either diploids or tetraploids, the most common progeny types had the same chromosome number as the male parent and showed complete and stable chromosome pairing. M. Borrill noted a high degree of cross fertility between different geographical races of diploids and between geographical races of tetraploids; the species studied is presumably cocksfoot.

W. E. Davies compared 16 experimental strains, developed from a population of Montgomery red clover and based on 3, 6 or 12 randomly selected plants, with a control based on 200 plants. While the control gave similar yields from the second to the fifth generation, the experimental strains showed an average decrease. There was evidence, however, that improvements could be effected by restricting the initial material to a limited number of superior plants.

Data on single crosses between second inbreds of lucerne, obtained by J. L. Fyfe, showed that reciprocal differences were negligible and the effects of specific combining ability generally nonsignificant; inferior lines could be eliminated by tests of general combining ability. There appeared to be a linear relation between yield and inbreeding coefficient, which should be considered in comparing single-cross or test-cross with double-cross performance.

A. M. Evans reported that induced polyploids of *Trifolium pratense, T. repens* and *Medicago sativa* can produce high yields and that their reduced fertility may be increased by selection. Interspecific hybridization in *Trifolium* has been achieved.

The difficulties of assessing yields of herbage plants grown or tested under different conditions were discussed by L. I. Jones.

D. J. Griffiths presented and discussed F_1 data from crosses between plants from A_2 and A_3 generations of induced $6x$ amphidiploids of *Avena barbata* x *A. strigosa* ssp. *hirtula* on the one hand and natural hexaploids and other amphidiploids on the other.

In his paper on selecting for yield in oats, J. D. Hayes spoke of the need for tests capable of detecting differences of 10% or less in yield.

D. G. Rowlands reported the occurrence in *Vicia faba* of cytological irregularities generally associated with the inbreeding of a naturally outbreeding species, and found both cross and self sterility in the species.

Work in progress at the Aberystwyth station is briefly reported.

Vorschau auf die vom 28. September bis 2. Oktober 1958 in Wiesbaden stattfindende 100. Versammlung Deutscher Naturforscher und Ärzte und die damit verbundene Schultagung. **(The programme of the 100th meeting of German Scientists and Doctors taking place in Wiesbaden from 28 September to 2 October 1958 and of the associated School Meeting).**
Naturwissenschaften 1958 : **45** : No. 14; Mitt. Ges. dtsch. NatForsch. Ärzte 1958 : No. 3 : 1–7.

1276 *Schramm, G. Die Bedeutung der Nucleinsäuren bei der Vermehrung der Viren. (The significance of nucleic acids in the reproduction of viruses). (p. 2).*

Mention is made of some of the research which indicates that the nucleic acid constituents of bacteriophages and viruses are of primary importance in the reproductive processes of these organisms.

1277 *Kuhn, R. Biochemie der Rezeptoren und Resistenzfaktoren. (Biochemistry of receptors and resistance factors). (p. 5).*

Microorganisms and higher organisms react variously to numerous harmful environmental factors, which may be physical or biotic. The tissues of susceptible organisms often differ from those of resistant organisms of the same kind in either lacking particular protective substances, the resistance factors, or in having others, the receptors, which confer susceptibility. This survey deals with the chemical nature of known resistance factors and receptors; also the role of such factors in relation to natural selection is discussed.

1278 Ergebnisse der Sonderkulturen-Versuche des Jahres 1956. **(Results of trials of special crops during the years 1956 and 1957).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1957 : **41** : Pp. 103; 1958 : **43** : Pp. 67; 1958 : **44** : Pp. 96. (Mimeographed).

Tabulated data on the results of variety trials conducted at Gumpenstein and other centres in Austria are presented. Amongst the crops tested were beetroot, kohl rabi, poppy, *Capsicum*, strawberry, radish, carrot, onion, cabbage, cauliflower, Brussels sprouts, lettuce, celery, peas and beans.

Atti del 3° Convegno Annuale della Società Italiana di Genetica Agraria al Centro Appenninico Terminillo-Rieti, 15–16 Luglio 1956. (**Proceedings of the 3rd Annual Meeting of the Italian Society for Agricultural Genetics at the Apennine Centre, Terminillo-Rieti, 15-16 July 1956**).
Genet. agr. 1957 : **8** : 53–367.

1279 *Zanini, E. & Ballatore, G. P. Prospettive agronomiche ed economiche della bieticoltura nell'Italia peninsulare.* (*Agronomic and economic prospects for beet cultivation in peninsular Italy*). (*pp. 55–62*).

The suitability of existing improved strains of sugar beet for southern Italy and Sicily is discussed in general terms and allusion is made to the possibilities of utilizing polyploidy and heterotic hybrids.

1280 *Scaramella Petri, P. Nuovi orientamenti nella selezione della bietola.* (*New directions in beet selection*). (*pp. 63–76*).

A correlation is believed to exist between sucrose content and the ratio of the cross-sectional areas of the vascular tissue, especially the sieve tubes, on the one hand, and the parenchyma, on the other. Since the correlation exists in both root and petiole, it is thought that selection for high sugar content can be assisted by examining the relative amounts of these tissues in cross sections of the petiole base.

1281 *Magnani, M. La bietola a semina autunnale.* (*Autumn-sown beet*). (*pp. 77–81*).

A description is given of the sugar-beet variety Cesena NSA. This form has a triennial habit, permitting of autumn sowing and harvesting the following summer undisturbed by bolting. It is recommended for southern Italy.

1282 *Porcelli, S. Aspetti agronomici della bietola da zucchero a semina autunnale in Puglia e Lucania.* (*Agronomic aspects of autumn-sown sugar beet in Puglia and Lucania*). (*pp. 82–128*).

Extensive trials to determine the optimum agronomic conditions for growing autumn-sown sugar beet in southern Italy are reported. The varieties least prone to bolting were Rovigo AU and Klein AA.

1283 *Sartori, G. A. Centro seme bietole.* (*A beet seed centre*). (*pp. 129–30*).

The work of the sugar-beet seed production centre at Badia Polesine, Rovigo, is briefly described.

1284 *Dionigi, A. Sul miglioramento genetico della bietola autunnale.* (*On the genetic improvement of autumn beet*). (*pp. 131–37*).

Breeding sugar beet for optimum suitability for autumn sowing is discussed. It is concluded that existing varieties offer sufficient variability in developmental rhythm to act as a promising starting point for selection.

1285 *Dionigi, A. La "terza via" per il miglioramento genetico dei grani duri.* (*The "third way" for the genetic improvement of the hard wheats*). (*pp 138–42*).

The optimum cycle of development of hard wheat for southern Italy is of the late-early type. It is suggested that this characteristic could be incorporated into *Triticum durum* by hybridization with *T. turgidum.*

1286 *Davey, V. McM.* Brassica *root crops in Scotland.* (*pp. 143–50*).

Information on the genetics of various plant characteristics of turnips and swedes and on breeding methods appropriate for these crops is provided, with special reference to the work of the Scottish Plant Breeding Station.

1287 *Bianchi, A. Introgressione teosintica e mutazioni nel mais.* (*Introgression of teosinte and mutations in maize*). (*pp. 151–60*).

Work on the effects of teosinte introgression on maize is reviewed, special attention being paid to knob number and enhancement of mutation rate.

1288 *Jucci, C. Eterosi e resistenza.* (*Heterosis and resistance*). (*pp. 228–59*).

[Cf. XXVIII, 2484].

1289 *Discussione.* (*Discussion*). (*pp. 325–35*).

A report is given of the discussions following the presentation of the preceding papers.

Atti del 4° Convegno Annuale della Società Italiana di Genetica Agraria a Recoaro (Vicenza) 10–11 June 1957. (**Proceedings of the 4th Annual Meeting of the Italian Society of Agricultural Genetics at Recoaro, Vicenza, 10-11 June 1957**).
Genet. agr. 1958 : **9** : 309–65.

The texts of further papers presented at the above meeting are given [cf. XXVIII, 4306–12].

1290 *Dionigi, A. Prova sperimentale della irrealtà delle "variazioni ereditarie" della "genetica orientale".* (*Experimental proof of the unreality of the "hereditary variations" of "eastern genetics"*). (*pp. 309–19*).

In 1929, a sample of the spring variety Mentana was divided into two lots, one of which was maintained as a spring-sown crop and the other as an autumn-sown crop. In 1957, the two lots were grown together in replicated sowings, one vernal and the other autumnal. In neither case did statistically significant differences in rhythm of development between the two lots emerge.

1291 *Bianchi, A. Conservazione di stipiti genetici di mais in Italia.* (*Conservation of genetic stocks of maize in Italy*). (*pp. 320–27*).

A collection of genetic stocks of maize is being maintained at the Genetic Centre at the University of Pavia and at the Institute of Plant Genetics of the University of Piacenza. It includes chromosome-marked strains, translocation stocks and other lines of interest to maize geneticists.

1292 *Scaramella Petri, P. Significato della forma e struttura nel* Solanum tuberosum *allevato a diverse altezze.* (*Significance of form and structure in* S. tuberosum *raised at different altitudes*). (*pp. 328–65*).

Variation in leaf morphology and anatomy of varieties grown at 400, 1100 and 1700 m. above sea level is described.

1293 GORIN, A. P. & PRIEZŽEV, G. V.
(Some results of scientific research at the P. I. Lisicyn Breeding and Genetical Station of the Timirjazev Agricultural Academy).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Akad.) 1958 : No. 5 : 13–28. [Russian].

Breeding research, mainly with cereals, at the above institute since 1948 is discussed, with an emphasis on investigations concerned with training for spring or winter habit, the nature of hybrid plants, directed training of hybrids and studies of natural hybridization, selective fertilization and supplementary pollination. Among the practical results are some high-yielding new winter wheats with fine grain quality and an improved form of Moscow 2453 winter wheat which is superior to the initial variety in yield, 1000-kernel weight and the percentage of vitreous grain. The new spring wheats include Milturum 15, a hybrid between a local variety from the Habarovsk region and a hybrid of *Triticum dicoccum* x *T. durum*. It outyields the standard spring variety Moscow, has good baking and milling properties and does not lodge.

Mention is made of heterotic hybrids of buckwheat obtained by the use of pollen mixtures. The new barley varieties Nutans 226 and Nutans 4736 outyield the standard Viner by 4·5–8·2 c. per ha. and are resistant to lodging and *Helminthosporium*.

1294 IVANOV, A. P.
(Improving the work in state varietal testing).
Selekcija i Semenovodstvo (Breeding & seed-growing) 1958 : No. 3 : 43–46. [Russian].

The State Varietal Commission is criticized for: (1) issuing annually revised lists of regional standard varieties, not usually greatly superior to the older varieties of crop plants, (2) permitting several standards in a single region, (3) neglecting to report on varietal trials each year; and (4) engaging in breeding work which is regarded as outside its duties. Some improved new varieties of wheat, buckwheat, barley and soya bean bred by the State Varietal Commission are named.

(A scientific conference on plant protection, 27-31 March 1958).
Vilnius 1958 : Pp. 84. [Russian].

Reports read at a conference held in March 1958 at the Lithuanian Agricultural Scientific Research Institute are presented. The following papers are of interest to the plant breeder.

1295 *Minkjavičus, A. & Vinickas, Z.* (*Scientific research on plant diseases and pests in the Lithuanian SSR and its aims*). (*pp. 3–4*).

Mention is made of new varieties of wheat and potato from the Dotnuva Breeding Station; they are said to be resistant to the more common diseases of these plants.

1296 *Vinickas, Z., Strukčinskas, M. & Žemajtene, P.* (*Some questions of oat resistance to crown rust*). (*pp. 46–47*).

Breeding oats for resistance to crown rust in Lithuania is discussed. The methods comprise selection of resistant families in local populations and hybridization involving a resistant parent such as Soviet. The latter was found to be superior in resistance to all Lithuanian-bred varieties. A reference is also made to training varieties and hybrids for resistance by growing several plant generations on rich soil dressed with P and K fertilizers. The resistance of the high-yielding Lithuanian variety Girunes was improved by the latter method by 18–37% within four years.

1297 *Strukčinskas, M.* (*Empty ears in winter wheat under the conditions of the Lithuanian SSR*). (*p. 54*).

Among the varieties grown in Lithuania, the wheat-*Agropyron* hybrid 599 and the variety 613 showed the highest degree of resistance to empty ears, caused by *Fusarium*, *Ophiobolus*, *Helminthosporium*, *Alternaria* and other fungi attacking the roots.

1298 *Efremenko, T. S.* (*The basis for selecting components and methods of crossing for producing wart-resistant varieties of potato*). (*pp. 65–67*).

A large number of potato varieties and hybrids bred in the Baltic Republics were tested for wart resistance at the Lithuanian Research Station and 66·5% of them found to be resistant. The highest proportion of resistant forms was produced by sexual hybridization; others were obtained by clonal selection or vegetative hybridization.

Most of the resistant hybrids, obtained by sexual hybridization, were from crossing of two resistant varieties or from crossing involving a resistant component as the female parent. Several varieties giving a high percentage of resistant forms among their progeny are listed and 14 combinations which give 100% resistant progeny are named.

1299 *Randalu, I.* (*The distribution and extent of damage due to* Helminthosporium *in barley in the Estonian SSR and their control*). (*pp. 68–69*).

H. sativum (*Cochliobulus sativus*) causes the most injury to barley and not *H. gramineum* as has been previously held. Jygeva 453 was found to be the most resistant cultivar.

1300 TARDIEU, M.
Les cultures d'appoint dans la zone d'action du CRA Bambey. (**Minor crops in the action zone of the Agronomic Research Centre, Bambey**).
Bull. agron. Fr. d'out. mer 1957 : No. 17 : 5–54.

Notes are provided on the cultivation and varietal characters of crops of secondary importance grown in the Sudanese region of French Africa; these crops include *Phaseolus acutifolius*, *Dolichos lablab*, *Vigna sinensis*, *Voandzeia subterranea*, *Manihot utilissima*, *Ricinus communis*, *Citrullus vulgaris*, *Hibiscus sabdariffa* and *H. esculentus*. In some cases, mention is made of ways in which breeders hope to improve the crops.

1301 **Progress Report of the Experimental Farm, Prince George, British Columbia, 1952-1956** (1958) : Pp. 38.

Cereals. Yield and maturity data for some of the principal oat varieties tested are presented. Of the barley varieties studied, Olli was found to be most suitable for the Prince George area; it is early and gives a satisfactory yield.

Forage crops. Individual plant selection has been carried out with Alsike clover with a view to producing superior forage types giving a high yield of seed. The open-pollinated progeny from these selections was reselected and the procedure repeated. Selection for resistance to witches' broom and root rot diseases is also in progress; some of the lines differ markedly in their reaction to disease. The results are reported of trials of double-cut and single-cut varieties of red clover. Tests of meadow fescue and timothy have revealed no superior varieties.

Potato. Gold Coin gave the best performance in variety trials at Terrace; only Kennebec outyielded Gold Coin but the former is of lower quality.

Fruit. Of the fifteen raspberries tested at Prince George, Chief was the most winter hardy but was not highly productive. Washington, Willamette and Taylor did well in other trials in the Terrace area. The black currants Kerry, Climax and Magnus were found to be hardy and productive; the quality of their berries was outstanding. Diploma, Stephens and London gave the best performance of the 16 red-currant varieties tested; these varieties were also hardy. The gooseberries Abundance and Pixwell were fully winter hardy and productive; Thoreson (Pembina Pride) yielded more than all other varieties during two years out of five. Winter killing and injury occurred in all the strawberry varieties studied at Prince George; British Sovereign gave the best performance in trials held at other stations. None of the apple and crab varieties, hybrids and selections gave a satisfactory performance. The pears Olia and Tioma have been quite hardy. Three selections of saskatoons obtained from Beaverlodge, Alta., were hardy and fruited well.

Vegetables. Variety trials of common garden vegetables are mentioned but no details are provided.

1302 Servicio Cooperativo Interamericano de Agricultura. Informe anual 1957. (**Inter-American Cooperative Service for Agriculture. Annual report, 1957**) : Pp. 192. (Mimeographed).

The following information on work in Guatemala is included.

Wheat. Selections have been made from intervarietal crosses between native and introduced material. Lerma 52, which is highly rust resistant, and II2809 [cf. XXVIII, 2672], which is highly resistant to yellow rust and brown rust but moderately susceptible to black rust, are being multiplied; both yield about 100% more than Supremo 211.

Maize. In developing material for the cold zone, numerous crossings and selfings have been carried out. Several local lines have given good yields and shown other promising characteristics. In the intermediate zone, the hybrid Guatica–H–301 has yielded well. A number of S_1 and S_2 lines being used in breeding for the hot zone are mentioned. Two synthetic varieties are being developed, for which the lines Rocamex V–520C and 142–56 form the basic material while the remaining 50% of the germ plasm is contributed by yellow and white S_1 lines of varying origin.

Coffee. Among irradiated seeds obtained from the Brookhaven National Laboratory, USA, most of those which germinated showed characters of the *anomala* type in varying degrees, such as divided stems, signs of fasciation, one, two, three or four leaves per node and differences in texture and colour of the leaves. Hybrids of Maragogipe x San Ramón have been back crossed to Maragogipe with the aim of obtaining a favourable combination of yield characters. In addition, Kona has been crossed with other *Coffea arabica* varieties of commercial importance. Resistance to canker has been observed in some varieties.

Cacao. Descriptions are given of promising trees undergoing yield tests; they belong to the subtypes Amelonado, Calabacillo, Angoleta and Cundeamor of the type Forastero.

Hevea. Numerous crosses between 23 oriental mother clones susceptible to South American leaf disease and 65 resistant Brazilian pollen parents have been effected. Resistant selections have been obtained from open-pollinated seed from high-yielding susceptible oriental clones grown together with resistant hybrid clones, the aim being to combine high yield with resistance. Tabulated data on the yields given by selections of wild material and hybrid clones are included and the crosses carried out are listed.

Tomato. Fifteen lines showing resistance to *Phytophthora infestans* are listed; 14 of them derive from material from Costa Rica, the fifteenth from a Mexican variety.

Phaseolus. The varieties 2824, 2226B, 2473 and 5091 have yielded well in trials and are recommended to growers, the first for the hot zone (0–3000 ft.) and the others for the intermediate zone (3000–5500 ft.).

1303 **Annual Report of the School of Agriculture, North Carolina State College for 1957** : Pp. 33.

Sorghum. New varieties and hybrids bred at other institutions or by commercial firms are being tested; development of new varieties is also under way.

Tobacco. Attempts are being made to combine resistance to various diseases with other desirable characters. Breeding lines which are resistant to nematodes and also produce plants of a good type have been obtained; other lines are resistant to the root-knot nematode and bacterial wilt.

Pepper. The demand for processed Hungarian yellow wax and red cherry peppers has been increasing. Trials were carried out and selection made for desirable quality, shape and colour.

Grape. The Dearing grape was released [cf. XXVIII, 4705].

Cucumber. Two new varieties named Fletcher and Ashe were released. These are of the fresh-market type and resistant to downy mildew and scab [cf. 825].

Soya bean. Of 2800 lines tested for resistance to nematodes, four lines were found to be almost free of cysts. These lines are not suitable for commercial use and so a programme of transferring this resistance to useful varieties was started.

1304 Investigación agrícola en "Tibaitatá." (**Agricultural research in Tibaitatá**). Bol. misc. DIA, Bogotá 1958 : No. 1 : Pp. 70.

Wheat. The new varieties 2809–2b–4b–3b–1T and 2809–2b–2b–1T, both from Frocor x Yaqui-Kentana, and 4765–17b–3t–1B, from Frocor x Frontana-Yaqui, yield well, are resistant to stem rust and yellow rust and are good in bread-making and milling quality and in agronomic characters. All three are being multiplied.

Maize. A collection of introduced and Colombian varieties is under study. Inbred lines, top crosses, varietal crosses, single and double hybrids and crosses of single hybrids with varieties are being developed. Diacol V 551, a new variety obtained by crossing and mass selection in a collection of local varieties, is a non-floury white maize resistant to *Helminthosporium* and adapted to altitudes of 2200–2800 m. It yields 4000 kg./ha. and has a vegetative period of 320 days. Two promising intervarietal hybrids are Rocamex x V7 x Blanco Rubí [White Ruby] and Harinoso Amarillo [Yellow Floury]–Cundinamarca 365 x Ecuador 466.

Barley. Three new varieties, Funza, Bachué and Tequendama, have been produced. The first, developed by mass selection from collections of local material, outyields the older varieties Raspa and Pocha by 40% and is

described as very satisfactory in malting and brewing quality. Bachué is highly resistant to lodging, is earlier in ripening than Funza, yields slightly more and is moderately resistant to leaf rust. Tequendama resembles Funza in agronomic characters and is good in malting quality. All three varieties are susceptible to loose smut.
Potato. The new varieties 50–57–67 and 50–57–63, both from Branca Cascuda [Thick-skinned White] x Pana Blanca [White Plush] are promising; the first shows field resistance to *Phytophthora infestans*.
***Phaseolus*.** Collections are being studied, and testing, hybridization and selection for vigour and disease resistance are in progress.

1305 Frankel, O. H.
The dynamics of plant breeding.
J. Aust. Inst. agric. Sci. 1958 : **24** : 112–23.

The topic is discussed under the five headings: (1) the dynamics of breeding objectives, (2) the dynamics of discrimination, (3) the raw materials—elements of change, (4) the dynamics of breeding and selection methods, and (5) the new specificity, with a view to emphasizing the increasing importance of studies of the metabolism of the plant, as distinct from a study of genetics and cytology only, and of a synthesis of all the related sciences involved in this new, wider picture of plant breeding.

1306 Gilbert, N. E. G.
Diallel cross in plant breeding.
Heredity 1958 : **12** : 477–92.

The utility of the information obtainable from a diallel cross is critically considered, reference being made to data available in the literature and to some new results obtained from a diallel cross of tomatoes. Certain theoretical defects in the polygene analysis of diallel crosses are pointed out; also the results are not thought to be directly relevant to practical breeding. Although the performance of the parental varieties is useful in predicting the relative behaviour of the crosses, the diallel cross does contribute further information that cannot be obtained directly from the parents but this additional information is not equal in importance to the parental performance.
It is suggested that, in dealing with a large quantity of breeding material, an ordinary variety trial might be used to determine the best 15 or 20 lines. These varieties could then be used in a fractional diallel cross with each parent represented in about eight crosses. Alternatively a complete 10 x 10 cross might be made with a smaller group of selected parents.

1307 Bhaduri, P. N.
Cytogenetics and crop improvement.
Sci. & Cult. 1958 : **23** : 514–22.

The text is given of the presidential address delivered in the section on agricultural sciences at the Forty-fifth Indian Science Congress, held at Madras in January 1958. The author surveys cytogenetical methods of breeding and stresses the importance of their application in planning programmes of crop improvement in India.

1308 Nohe
Die Kreuzung (Schluss). [**Crossing (Conclusion)**].
Saatgutwirtschaft 1958 : **10** : Samenfachmann 1958 : No. 10 : 74–78.

The last article in this popular series is concerned with the practical details of artificial cross pollination [cf. 245].

1309 Cicin, N. V.
(**Some questions of theory and practice in distant hybridization of plants**).
Selekcija i Semenovodstvo (Breeding & seed-growing) 1958 : No. 3 : 5–14. [Russian].

This report is essentially the same as that previously referred to [cf. XXVIII, 3664].

1310 Sinskaja, E. N.
(**The theory of populations and its importance in plant cultivation**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 1 : 52–61. [Russian].

Factors influencing the composition of a population of a variety or ecotype may be divided into three groups according to their effects: (1) those which tend to increase the visible variability of the population; (2) stabilizing factors which maintain the population as a breeding unit; and (3) factors which decrease the visible variability, an effect which is usually associated with a lowering of the vigour of all or most of the components of a population. The complex of conditions in a region where a particular variety has been raised has a stabilizing effect on the variety, but if the population is transferred to different conditions it will resolve into varying biotypes which will respond to selection. The application of these considerations to breeding is discussed.

1311 CHENG, C.-F.
(Circumstances of the application of atomic power to the improvement of Taiwan crop-plant varieties).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 21 : 65–68. [Chinese].

Taiwan varieties of various crops have been treated locally with X rays to induce useful mutations and have been sent to the Brookhaven National Laboratory, USA, for neutron and X-ray treatment. The following promising variants have been obtained: rice strains with improved earliness, straw stiffness and disease resistance and altered in height; heavier yielding barleys; sweet potatoes with improved earliness and yield and differing in pigmentation; groundnuts with increased yield; and soya beans with an increased number of pods.

1312 PRUCKOVA, M. G.
(A wealth of varieties from the USSR at the international exhibition in Brussels).
Zemledelie (Agriculture) 1958 : No. 4 : 46–49. [Russian].

Descriptions are given of Soviet varieties of cereals, leguminous forage plants, fibres, sugar beet, oil plants and vegetables, including pulses and melons. Most varieties have been long in cultivation or, as in the case of new varieties such as the wheats Bezostaja 4 [Awnless 4] and Belaja Cerkov' 198, have been previously described [cf. XXVII, 2727].

1313 HAUSSMANN, G.
Poliploidia nel miglioramento delle piante coltivate. **(Polyploidy in the improvement of cultivated plants).**
Sementi elette 1958 : **4** : No. 4 : 30–38.

A summary is presented of the contributions on the subject made at the fifth session of the Società Italiana di Genetica Agraria [Italian Society of Agricultural Genetics] at Voghera in June 1958. The characteristics of polyploid forms of sugar beet are outlined and the promising results of growing them in certain parts of Italy are mentioned. Though the improvement in *Lolium perenne*, *L. italicum* and *L. multiflorum* has up to now not been very marked, it is suggested that the true possibilities of the polyploid forms can only be assessed after a more extended period of selection; after selection for seed production some polyploids of *Lolium* spp. and of *Poa palustris* have proved equal or even superior to the diploids. Reference was also made to fertile hybrids of *Lolium* x *Festuca* obtained by chromosome duplication [cf. XXVII, 602 and XXVI, 459]. Seed yields of 2·5 c. per ha. are reported from the Swedish tetraploid WR28 of *Trifolium pratense* when grown in Italy; in the second year it gave 2·2 c. per ha.; these yields are quite comparable to those of diploid varieties such as Violetta. The tetraploids are more resistant to drought and root rot but most of the evidence examined indicates that they are somewhat less hardy than the diploids.

1314 WILLEY, L. A. & DENT, J. W.
Note on a method for sampling green crops for dry-matter determination.
Emp. J. exp. Agric. 1958 : **26** : 379–81.

In the method described, the material is passed through a mechanical chopper prior to sampling. This method is rapid and the sample material is obtained in a form suitable for oven drying; the sampling error is low.

1315 **(A list of varieties of agricultural plants collected by the scientific workers of the Institute of Plant Industry, I. A. Sizov, V. I. Razumov, P. P. Lubenec and T. N. Ševčuk, in the Bulgarian People's Republic in 1956).**
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 67–71. [Russian].

A total of 201 varieties of wheat, rye, oats, maize, barley, rice, lucerne, vetch, cotton, flax, sorghum, tobacco, poppy, *Capsicum* pepper, sunflower, groundnut, carrot, onion, cabbage, pumpkin, tomato and pulses, together with their place of origin, are listed.

1316 DAY, P. R.
Nature and genetical control of resistance in living organisms.
Nature, Lond. 1958 : **182** : 921–22.

Papers on the above topic were presented at a joint session of the Zoology and Botany Sections of the British Association on 1 September, 1958. P. R. Day discussed the interaction of resistance genes in the host with avirulence genes in the pathogen, referring chiefly to work on apple scab. M. Barber, in a paper on drug resistance in bacteria, described how resistance may be genetically transferred by transformation or conjugation and discussed the medical and agricultural problems arising from the development of resistant pathogens. A. Kleczkowski surveyed resistance to virus diseases in plants and animals.

1317 Ghillini, C. A.
Nuove acquisizioni sulla resistenza delle piante alle malattie parassitarie. (**New data on the resistance of plants to parasitic diseases**).
Agricoltura d. Venezie 1958 : **12** : 561–68.

Recent work on the nature of disease resistance and on the various methods in current use for breeding disease-resistant varieties is briefly surveyed.

1318 s'Jacob, J. C.
Phytopathologische Probleme bei der Resistenzzüchtung. (**Phytopathological problems in breeding for resistance**).
Z. Pflanzenz. 1958 : **40** : 113–24.

The present discussion of the problems involved in obtaining reliable results in inoculating and testing for resistance in plant breeding is essentially similar to that in an earlier article already summarized [XXVII, 4296].

1319 Reichert, I.
Fungi and plant diseases in relation to biogeography.
Trans. NY Acad. Sci. 1958 : **20** : 333–39.

From a study of the respective distributions of *Sclerotinia sclerotiorum*, of the genus *Sclerotinia* and of the family Sclerotiniaceae, it is concluded that the gene centre of the family lies in North America, and it is suggested that crop varieties resistant to *S. sclerotiorum* may be found in the same area.

1320 **Plants have heart attacks.**
World Crops 1958 : **10** : 391–92.

At the 133rd national meeting of the American Chemical Society, news was provided of investigations in progress at the University of Wisconsin on resistance to *Fusarium* wilt. In susceptible plants, the pectin of the xylem vessels is attacked by an enzyme produced by the pathogen; masses of pectin may then block the vascular system. In resistant plants, substances toxic to the pathogen are produced and the fungus produces less of the pectin-attacking enzyme.

1321 Singh, G. P.
Temperature studies of barley stripe mosaic virus in certain cereal crops, and tobacco mosaic virus in pepper.
Diss. Abstr. 1958 : **18** : IC Card Mic 58–1928 : 1956–57. (Abst.).

In studies of the effects of postinoculation temperatures of 16°, 20°, 24° and 28° C. on the expression of barley stripe mosaic virus in susceptible barley, wheat and sweet corn varieties and in resistant barleys, severity of symptoms increased with temperature and resistant plants became susceptible. Seed transmission in resistant plants was higher at higher temperatures. Increased severity of symptoms at higher temperatures was observed also in resistant and susceptible *Capsicum* varieties inoculated with tobacco mosaic virus.

CEREALS

1322 Ergebnisse der Getreideversuche des Jahres 1956/57. (**Results of the cereal trials of the year 1956/57**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1957 : **43** : 1–67.

Tabulated data on the results of varietal trials held at Gumpenstein and other centres in Austria are presented. The cereals tested included wheat, oats, rye and barley.

1323 Pérez-Navarro y Flórez-Estrada, A. & Matallana Ventura, J.
Memoria de los trabajos realizados por la Sección de Cebadas y Avenas del Centro de Cerealicultura de Madrid durante el año 1956. (**Report on work carried out in the barley and oats section of the Cereal Centre at Madrid in 1956**).
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 61–198.

Maintenance of the collection of 1452 oat varieties is continuing. In addition, 148 barley selections, 12 oat selections and 171 new hybrid barley lines developed at the centre are also being maintained. Eight new barley crosses have been effected. Reports of numerous yield trials of both crops are included.

1324 Zaharčenko, S. A.
(**Some grain crops of Central China**).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 28–35. [Russian].

Wheat. Pei-hsi II, Tsum-hsi 68 and Hua-pe 672 have recently been bred at Peking. All three and also an older variety 1885 are distinguished by high yield under the climatic and soil conditions of northern China. The results of breeding work at Hankow include an interspecific hybrid of *Triticum aestivum* x *T. turgidum* and new selections with large grain and resistance to fungi and lodging. Among the new varieties from Chengtu, Szechwan, is Chuang-li 101, a hybrid between a local and an American variety. It has a short growth period, does not lodge and outyields the common variety Nang-ta 2419 by 10%. Mention is made of a collection of short-strawed wheats from northwestern China at Ukung.

Maize. Mention is made of maize collections at various regional breeding research institutes, that at Peking including 60 inbred lines. An interline hybrid Kung-ling-pai x 197, with an average yield of 60 c. per ha. in 7 years, is referred to as the most productive maize in northern China. Several local varieties from the province of Szechwan, differing with regard to their yielding capacity and growth period, are listed. Worth mention are Tung-hsi-chu 3, with a yield of 52–55 c. per ha. and a growth period of 100 days, and Chu-kung-pao-ku, which ripens in 75 days and is resistant to *Helminthosporium*. Hung-sing-pai, from the province of Shensi, is mentioned for ability to form several ears per plant, ripening in 120 days. On rich soil it yields more than 80 c. per ha.

1325 Atkins, I. M., Gardenhire, J. H., Weibel, D. E., Porter, K. B. & Lahr, K. A.
Performance of small grain varieties in Texas, 1949-57.
Bull. Tex. agric. Exp. Sta. 1958 : No. 899 : Pp. 19.

The results are reported of trials carried out in 23 localities in Texas with commercial varieties of wheat, oats and barley. Varieties are recommended for different growing areas of the state.

1326 Ševčuk, T. N.
(**The local varieties of cereal crops from Transcarpathia**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 1 : 62–72. [Russian].

Morphological, physiological and biochemical descriptions are given of forms of wheat, oats, rye, maize and barley from Transcarpathia at the Institute of Plant Industry, and reference is made to their breeding value. Transcarpathian varieties of grain sorghum and *Panicum* and *Setaria* millets are also of interest to breeders.

1327 Fadrhons, J.
Výnosové složky obilních odrůd. (**The yield components of cereal crops**).
Sborn. čsl. Acad. zeměd. Věd: Rada rostlinná Výroba 1958 : **31** : 317–30.

The productiveness of some varieties and hybrids of wheat, rye and barley was studied at Semčice, Czechoslovakia; in particular the relations between yield, tillering capacity, weight and number of grains per ear and 1000-grain weight were investigated. It was found that a high grain yield per unit area of all the above cereals depends upon a combination of good tillering capacity with productive ears, the latter characteristic being closely associated with a high 1000-grain weight. A positive correlation was found between culm and ear weight in winter rye and between productiveness and the growth period from tillering to flowering in winter rye and spring wheat. The most productive among winter wheats were those resembling Czech semiwinter wheats in habit and growth period. The most productive forms of all the above cereals were derivatives from crosses between varieties from regions towards the south-east and north-west. Such forms combine the good tillering capacity and many grains per ear of the south-eastern forms with the large grain yield per ear and high 1000-grain weight of the north-western types.

1328 Junghans, K.-H.
Der Einfluss der Höhenlage auf den Ertragsverlauf der Weizen-, Gerste- und Hafersorten der DDR. (**The influence of the altitude on the yielding capacity of wheat, barley, and oat varieties in the German Democratic Republic**).
Dtsch. Landw., Berl. 1958 : **9** : 469–73.

The results are reported of yield trials held in various localities of differing altitude in the Harz region of Germany; these experiments provided a severe test of frost resistance.

1329 Dantuma, G.
Veredeling van tarwe en gerst op winterhardheid. (**Breeding wheat and barley for winter hardiness**).
Proefschr. LandbHoogesch Wageningen 1958 : Pp. 71; and Meded. Sticht. PlantVeredel., Wageningen No. 18.

This is the full version of a paper already summarized from a short report in English [cf. 253].

1330 Vallega, J., Cenoz, H. P., Tessi, J. L., Frecha, J. H. & Rodriguez Amieva, P. J.
Las enfermedades de los cereales en 1955 y 1956 y comportamiento de las variedades cultivadas de trigo, avena y cebada. (**Cereal diseases in 1955 and 1956 and the behaviour of cultivated varieties of wheat, oats and barley**).
Bol. Inform. Inst. Fitotec. Minist. Agric. Ganad., Argent. 1957 : No. 4 : Pp. 7.

Tables showing the incidence and severity of fungal diseases on numerous varieties and new selections of wheat, barley and oats at various localities in Argentina during 1955 and 1956 are presented and discussed. The chief rust races found are noted.

1331 CALDWELL, R. M., SCHAFER, J. F., COMPTON, L. E. & PATTERSON, F. L.
Tolerance to cereal leaf rusts.
Science 1958 : **128** : 714–15.

Theoretically, tolerance should have the advantage of greater stability than resistance due to hypersensitivity. If a race of the pathogen arises of which a previously tolerant variety is not tolerant, it may be expected that the host will undergo greater injury but that the new race will not have any competitive advantage over established races. Evidence has been obtained at Lafayette, Ind., that the oat Benton, which is susceptible to *Puccinia coronata*, possesses a high degree of tolerance of this pathogen. Study of the inheritance of tolerance of *P. coronata* and *P. triticina* has been initiated and the possibility of introducing tolerance into commercially acceptable varieties is to be explored.

1332 **Report of cooperative uniform cereal rust observation nurseries for the year 1957.**
US Dep. Agric., Agric. Res. Serv., Crops Res. Div., Pl. Industr. St., Beltsville, Md. 1958 : No. 39 : Pp. 33. (Mimeographed).

A summary and discussion are given of data obtained on the reactions of varieties and selections of (1) wheat and barley to stem and leaf rusts and (2) oats to stem and crown rusts in tests carried out in the USA and at the Dominion Plant Pathology Laboratory, Winnipeg. Information on physiological races of the pathogens is also provided.

1333 SMEDGÅRD, G.
Havrenematoden måste bekämpas. **(The oat eelworm must be controlled).**
Lantmannen, Stockholm 1958 : **69** : 977–79.

Tests for eelworm resistance in Sweden are reported. Among seven oat varieties with an average of 12·4 cysts per plant, Sol II was most resistant, with 2·8 cysts per plant. For five barleys the average value was 2·1, for the variety Kungs [King], 0·0. The spring wheats had an average of 15·8, Safir [Sapphire] being best with 10·3.

1334 MANO DUTTA PATHAK
The interrelations of host plants and insects as studied through the use of biotypes of corn leaf aphid and varieties of plants.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1265 : p. 1562. (Abst.).

Investigations at Kansas State College revealed the existence of two additional biotypes of *Rhopalosiphum maidis*; four biotypes are now known [cf. XXVII, 1814]. Studies were made of the interactions of these biotypes with wheat, barley, oat, sorghum and maize varieties.
The fecundity of all four biotypes was greatly reduced on the resistant sorghum, Piper 428–1, as compared with that on the susceptible sorghum White Martin; biotype KS–2 had the greatest fecundity on Piper 428–1. Fecundity was also greatly reduced on wheat varieties; although seedlings of *Triticum timopheevi* were very resistant to aphid development, their susceptibility increased when the plants were several weeks old. On the highly resistant barley, Kentucky 1, all the biotypes showed normal fecundity except KS–2, whose fecundity was greatly reduced. Reproduction was rapid in all biotypes on the susceptible barley Spartan. Seedlings of both resistant and susceptible maize varieties showed high resistance to the aphids under field conditions; susceptibility increased after the plants were four weeks old. Of the four biotypes, KS–3 had the greatest fecundity on resistant maize. Seedlings and mature plants homozygous for the *"id"* genes were highly susceptible. The fecundity of the biotypes was not related to the damage they caused on two of the susceptible species. On White Martin, the biotypes are arranged in descending order of damage as KS–1, KS–3, KS–2 and KS–4; on Spartan the order is KS–1, KS–4, KS–2 and KS–3. Aphids reared on Spartan weighed more than those from White Martin plants, biotype KS–3 being heaviest in both cases. All biotypes gained more weight on White Martin than on Piper 428–1 plants. Biotype KS–2 took the most material from resistant plants. KS–1 aphids were reared for some time on White Martin x Piper 428–1 F_1 plants; these aphids showed no increased ability to develop on Piper 428–1. The geographical distribution of the biotypes in Kansas was studied; KS–1 was the most common.

WHEAT

1335 FUJII, T.
Radio-sensitivity in *Triticum* and *Aegilops*.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : p. 11.

Dormant seeds of diploid, tetraploid and hexaploid plants of several species and varieties of *Triticum* and *Aegilops* were irradiated by γ ray doses of 20 to 70 kr. *Aegilops* was more tolerant of the treatment than *Triticum*, as shown by the effect on germination rate and length of the seedlings. Diploid species of each genus were more sensitive than the tetraploids or hexaploids, whereas hexaploids were not more resistant than tetraploids. Differences were also noted between varieties and species within a genus. These results indicated that radiosensitivity depends not only on the genome but also on the alleles present.

1336 Wintertarwe, 1958. **(Winter wheat, 1958).**
Landbouwvoorlichting **15** : Bijl. 34; Ber. Rassenkeuze 1958 : No. 251 : unpaginated.

Among 22 varieties tested on different soil types in the Netherlands, the new varieties CIV 237, CIV 309, MGH 698 and Stella have yielded well and shown good winter hardiness.

1337 Shen, T.-H. & King, Y.-K. [Chin, Y.-H.]
(Studies on spring wheat production in Taiwan).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 22 : 1–4. [Chinese].
Shen, T. H. & King, Y. K.
Spring wheat production in Taiwan.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : p. 16.

[Cf. XXVIII, 2738].

Fifteenth annual report on winter wheat improvement in Ontario. 1957 crop.
1958 : Pp. 21.

1338 *Waddell, W. H. Winter wheat improvement at the Ontario Agricultural College. (pp. 1–4).*

The characters of the new red winter wheat named Kent are mentioned [cf. XXVIII, 289]. A report is presented of a trial held at five stations; one hybrid outyielded Genesee and three others had only slightly lower yields. One of the hybrids tested was resistant to leaf smut and another had strong straw.

1339 *Whiteside, A. G. O. & Edgar, J. Winter wheat improvement at Central Experimental Farm, Ottawa. (pp. 7–8).*

Richmond and Genesee have given the best performance in trials held during 1951–57. Data are provided on the percentage infection by dwarf bunt of several varieties grown at Paisley during 1955–57. Breeding for bunt resistance was continued with hybrid lines from the cross 4719 (Rex - Oro CI12421 x Cornell 595) x Cornell 595. Lines have been selected which are free of *Tilletia foetida*, race 16 of *T. caries*, *T. contraversa* and *Ustilago tritici*. Genes for resistance to the bunts came from Rex - Oro CI12421, and Cornell 595 contributed genes for resistance to loose smut. These lines are more susceptible to mildew than Cornell 595 and Genesee; some have been crossed with better agronomic varieties. The combinations (27–15 x Rex - Rio 41) x Genesee and (27–15 x Rex - Rio 53) x Genesee and back crosses to Genesee have reached the F_5 generation; in these crosses, Genesee has been combined with hard white winter wheats from Pullman, Wash., these latter being resistant to bunts but susceptible to mildew and loose smut. Lines resistant to T16 and loose smut have been selected. Richmond has been crossed with Cornell 595, Genesee and other varieties, the aim being to produce high-yielding varieties which have resistance to loose smut and *T. foetida*. Breeding for short straw and also for leaf rust resistance has continued.

1340 *Clark, G. H. Winter wheat improvement work at the Experimental Farm, Harrow, 1957. (pp. 9–10).*

Breeding for resistance to *Septoria* leaf blotch has begun. A number of varieties have outyielded Genesee in recent trials. The varieties 3909C, GC480 and Kent have shown good field resistance to leaf rust. In another test of 25 varieties, the strains 441B8-3, 4708–4 and 4317–5–2 were particularly resistant to leaf rust; 441B8–3 was also noted for its high yield. The new strain 4708–4 performed well in a test on soil of Perth clay loam.

1341 *The co-operative winter wheat test. (pp. 14–21).*

The cooperative test was made on 13 varieties and hybrids at six stations. Genesee gave the highest yield and Kent had the best straw of the named varieties. Detailed studies on the quality of the 13 varieties are also reported.

1342 Patil, J. A.
Inheritance study in wheat.
Curr. Sci. 1958 : **27** : 404–05.

The unbranched ear of *Triticum durum* 'Baxi 23' was dominant to the branched ear of *T. turgidum* 'F434' from Egypt and depended on a single gene.

1343 Nishio, K. & Nakagawa, M.
(Studies on the growth of wheat. III. The development of the young ears in wheat varieties of the erect and prostrate types).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 89–94. [Japanese].

The nine varieties used previously [259–60] were grown under three sets of conditions: (1)

autumn-sown (26 November) control; (2) early autumn sown (15 October); and (3) early autumn sown with long photoperiods. Of the three genes responsible for habit identified earlier, *E* was unaffected by the different treatments, *P* was affected by temperature, plants with this gene becoming erect at higher temperatures, while *T* was sensitive to photoperiod. Data are provided on the mode of development of the ear primordia and the heading date of the various genotypes for each of the three treatments.

1344 IVANOV, I.
(The effect of intravarietal crossing upon the wheats 14, Karnobatska Ranozrejka and Karnobat 92).
Naučn. Trud. 1958 : **3** : 1–6. [Bulgarian].

Intravarietal cross pollinations at Poljanovgrad improved the yields of 14 and Karnobat 92 in the F_1–F_4, the improvements being less noticeable with each successive generation. The experiments with Karnobatska Ranozrejka [Karnobat Early] were inconclusive.

1345 POLTAREV, E. M.
(The passage through the vernalization phase by hybrid and nonhybrid wheats under natural conditions).
Agrobiologija (Agrobiology) 1958 : No. **3** : 34–40. [Russian].

The duration of the vernalization phase for a number of wheats was determined under Har'kov conditions. Hard spring wheats and hard semiwinter wheats are characterized by a shorter vernalization phase than soft winter wheats or most F_5 and F_6 hybrids between soft winter x hard spring wheat or soft winter wheat x hard semiwinter wheat. Some hybrids, however, had a longer vernalization phase than their soft winter-wheat parent. It is thought that such forms arose as a result of variable external conditions in the autumn or winter.

1346 FESENKO, N. V.
(A physiological method of emasculating wheat).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. **3** : 62–63. [Russian].

A labour-saving method, consisting of placing the plants in dark boxes at the onset of reduction division of the pollen mother cells for 48–60 hr., is described. It is based on observations that (1) the anthers are sensitive to curtailment of light and (2) the sensitivity is highest during microsporogenesis.

1347 STAUDT, G.
Spontane Bastarde zwischen *Triticum dicoccum* and *Triticum monococcum*. **(Spontaneous hybrids between *T. dicoccum* and *T. monococcum*).**
Z. Pflanzenz. 1958 : **40** : 262–65.

A single plant of *T. dicoccum* var. *farrum*, which had undergone colchicine treatment, gave after free pollination five offspring with a chromosome number of $2n = 21$. These plants appeared to be spontaneous hybrids between *T. dicoccum* and *T. monococcum*, as shown by their resemblance to artificial hybrids of the same parents. Also plants of *T. monococcum* were growing near to the *T. dicoccum* mother plant. The spontaneous hybrids were completely sterile.

1348 MALIANI, C.
La genetica al servizio delle mutate esigenze della produzione. L'incrocio interspecifico per la costituzione di nuove varietà di grani duri. **(Genetics at the service of changed requirements in production. Interspecific crossing to obtain new varieties of hard wheats).**
Genet. agr. 1957 : **8** : 368–81.

While Italian wheat breeders have brought about a conspicuous increase in the yield of *Triticum aestivum*, improvement of *T. durum* has been much slower. Fertile high-yielding segregates of *T. durum* type have, however, been obtained in the F_2 and later generations of crosses between Forlani (*T. aestivum* 'Villa Glori' x *T. turgidum* 'grano del miracolo' [Miracle wheat]) and the *T. durum* varieties Dauno III, Zeramek, Cappelli, Aziziah strains, Russello, Ruscia, Trigu 131, Sabaudia, Garigliano, AK Basale and Morru Canu.

1349 KUMP, M.
Genetical investigations on *Triticum vulgare* x *Secale cereale* hybrid. I. A study of some transgressive characters of the culm and ear in the F_4-gen.
Bull. Sci. Cons. Acad. Jugosl. 1958 : **4** : p. 24. (Abst.).

At the Institute for Plant Breeding and Genetics of the University of Zagreb, a single F_1 plant was obtained from a cross between a wheat designated *T. vulgare muticum* 'M–1830' and *S. cereale*. A back cross to the wheat parent was made, this being followed by selfing to produce F_3 and F_4 generations. Segregation and transgression in the F_4 were noted; it is concluded that the presence of the "I. rye chromosome or part of it" in the genome has no apparent effect on the degree of tillering and the thickness or length of the culm. "There was a significant correlation between the number of kernels per ear, the fertility per spikelet, the total weight of kernels per ear, and the 'smooth neck' character". There was no significant difference in the 1000-grain weight of smooth-necked and hairy-necked plants; therefore the I. rye chromosome does not depress kernel development. The shape of the kernels differed significantly in smooth and hairy necked plants but, in both groups, some plants had long kernels, there being no absolute difference between the groups in this respect. No correlation was found between texture of kernels and the hairy neck character or between colour and texture of kernels. Addition of the rye chromosome caused segregation in kernel colour in the F_3, and F_4 progeny showed positive transgression in comparison with the wheat parent; it is expected that, in further generations, some plants with desirable agronomic characters will occur.

1350 KNOTT, D. R.
The inheritance in wheat of a blue endosperm color derived from *Agropyron elongatum*.
Canad. J. Bot. 1958 : **36** : 571–74.

A wheat having blue endosperm and designated Blue A was obtained from [*Triticum vulgare* 'Rescue' ($2n = 42$) x *A. elongatum* ($2n = 72$)] x Rescue. Crosses were made between homozygous F_4 lines from a cross between Thatcher and Blue A, and Thatcher. Evidence was obtained that the gene or genes for blue endosperm are partially dominant, with a distinct dosage effect, and are carried on an *Agropyron* chromosome which is not homologous with a wheat chromosome.

1351 SIMONET, M.
Hybrides interspécifiques et intergénériques. (**Interspecific and intergeneric hybrids**).
Ann. Inst. nat. Rech. agron., Paris : Sér B. : 1957 : **7** : 395–411.

An account is provided of results obtained in France, mainly at the Central Plant Breeding Station, Versailles, in crosses between species of *Triticum* on the one hand and *Aegilops* or *Agropyron* on the other [cf. XXIII, 1852, XXV, 326 and XXVII, 1502 and 1838]. Also hybridizations involving *Iris* are described.

1352 MELETTI, M.
Nuovi metodi per il miglioramento genetico dei frumenti duri in Sardegna. (**New methods of genetic improvement of hard wheats in Sardinia**).
Sementi elette 1958 : **4** : No. **4** : 50–54.

From crosses of Dauno III with Cappelli, a good wheat for poor soils has been produced and is known as IIIB. Selection D77 from a Tunisian wheat has exceeded Cappelli in yield and several crosses between the local Timilia and various imported wheats are showing promise. The form Denti de Cani [Dogs' Teeth] occurs in fields of all varieties and is thought to be an alloploid between *Triticum durum* and *Haynaldia villosa* [cf. XXVIII, 2746]; in view of its tolerance of the most extreme climatic conditions it has been back crossed to *T. durum* 'Cappelli' and the hybrids are now under observation.

Some hybrids obtained from embryo grafting between bread wheat and barley show resemblances to *T. durum* and have short strong straw that does not lodge easily.

1353 KONDO, N. & KAMANOI, M.
Chromosome conjugation in the hybrids between Emmer wheat and induced autotetraploid *Aegilops squarrosa* or *Ae. bicornis*.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : 19–20.

Tabulated information is provided on the chromosome configurations at metaphase I in hybrids having the genome constitution ABDD or ABS^bS^b. The number of bivalents observed varied from three to nine, the mode being at seven. These seven pairs may arise from conjugations between D and D or S^b and S^b genomes, additional pairs being due to conjugations between A and B genomes. This would be in agreement with Kihara's findings that up to 3 conjugations occur in haploid *T. durum* (AB), three or four conjugations being found in hybrids. It is concluded that the seven pairs observed may have included some conjugations between the A and B genomes of Emmer wheat.

Trivalents were rarely observed in hybrids involving tetraploid *Ae. squarrosa*, whilst both trivalents and tetravalents were noted in hybrids of tetraploid *Ae. bicornis*, especially those involving *T. dicoccoides* var. *spontaneo-nigrum*. This indicated that the affinity between A or B and S^b genomes is higher than that between A or B and D genomes. It has been suggested that the B genome is homologous to the S^b

genome [cf. XXVII, 2768]; if this were true, hybrids between Emmer and 4*x* *Ae. bicornis* would have a genome constitution related to ABBB. However the maximum number of trivalents observed in these hybrids was two, whereas five trivalents have been found in hybrids between *Ae. cylindrica* and 4*x* *Ae. squarrosa* of genome constitution CDDD. It is therefore concluded that the B and S^b genomes are not homologous.

1354 FUKASAWA, H.

Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*, V. Critical evidence for uneffectiveness of alloplasm on hybridization.

Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 269–76.

Triticum durum var. *reichenbachii*, *T. dicoccum* 'Khapli' and *T. dicoccoides* var. *kotschyanum* were crossed reciprocally with *Aegilops ovata* [cf. XXVIII, 2743]. In *Ae. ovata* ♀ x Emmer wheats ♂, seed-set percentage was *ca.* 80% but in reciprocal combinations only 5·8–7·1%. The cytoplasm of the Emmer wheats was not however responsible for the low crossability in the latter crosses, since seed set was very low if ♂-sterile Emmer wheats with *Ae. ovata* cytoplasm were used as ♀ parents. No marked difference in pollen-tube behaviour was found between *Ae. ovata* x *T. durum* and the reciprocal. After two days, however, the proembryo in *Ae. ovata* x *T. durum* consisted of 2–4 cells while in the reciprocal the egg cell and polar nuclei remained undivided. When *Ae. ovata* with *T. durum* cytoplasm was pollinated by *T. durum*, seed-set percentage was as high as in normal *Ae. ovata* ♀ x *T. durum* ♂. With *Ae. ovata* as ♀, seed set was less with *T. dicoccoides* as ♂ than with *T. durum* or *T. dicoccum*. Significant differences in crossability were also found between ♂-sterile *T. durum* x *Ae. ovata* and ♂-sterile *T. dicoccum* x *Ae. ovata*. It appears that all these differences are attributable to disparities in the Emmer genomes, AABB.
No significant differences were obtained in seed setting between ♂-sterile *T. durum* + *Ae. ovata* cytoplasm x normal *T. durum* and normal *T. durum* x normal *T. durum* or between ♂-sterile *T. dicoccum* + *Ae. ovata* cytoplasm x normal *T. dicoccum*. When *Ae. ovata* + *T. durum* cytoplasm was crossed as ♀ with normal *Ae. ovata*, the seed-set percentage was nearly the same as that obtained when normal *Ae. ovata* plants constituted both parents. A test on pollen-sterile *T. dicoccum* x *T. dicoccum* gave no evidence that emasculation influenced degree of crossability. Crossabilities of reciprocal back crosses were also investigated. Seed-set percentage in (*T. durum* ♀ x *Ae. ovata* ♂) ♀ x *T. durum* ♂ did not differ significantly from that obtained with (*Ae. ovata* ♀ x *T. durum* ♂) ♀ x *T. durum* ♂. Crossability therefore appeared to depend mainly on the genome constitution of the ♀ parent. Crossability in (*T. durum* ♀ x *Ae. ovata* ♂) ♀ x *Ae. ovata* ♂ was however somewhat higher than in (*Ae. ovata* ♀ x *T. durum* ♂) ♀ x *Ae. ovata* ♂; the cause of this difference cannot be explained from the present data. Use of *T. durum* to pollinate *T. durum* x *Ae. ovata* and the reciprocal resulted in greater seed set than use of *Ae. ovata*.

1355 SATO, S.

(On crossability between wheat and rye).

Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 128–30. [Japanese].

Forty-one wheat varieties, mainly *T. aestivum* forms, were pollinated with three rye varieties. Crossability was not affected by the pollinating variety but was markedly influenced by the mother-plant variety. The best results were obtained with the Japanese varieties Nishimura, Semboku, Yoshida, Norin 3 [Ministry of Agriculture and Forestry 3] and Norin 14.

1356 SADANAGA, K.

Cytological studies of hybrids involving *Triticum durum* and *Secale cereale*. 1. Alien addition races in tetraploid wheat.

Cytologia, Tokyo 1957 : **22** : 312–21.

Already briefly reported cytological and morphological observations on hybrids of *Triticale* with *T. durum* and on back crosses of such hybrids to *T. durum* and *T. dicoccum* 'Khapli' are recorded in detail [cf. XXVIII, 271].

1357 NAKAJIMA, G.

(Genetical and cytological studies on the breeding of amphidiploid types by crossing wheat and rye. IX. Meiosis in PMCs of TSF$_3$ plants).

Senshokutai (Chromosome)/Kromosomo 1958 : No. 34–36 : 1194–206. [Japanese].

A preliminary account of F$_3$ plants of the cross *Triticum turgidum* x *S. cereale* has already been published [XXIV, 1832]. In the present paper, meiotic behaviour is described. The F$_3$ plants studied can be classified into six groups on the basis of chromosome number: (1) $2n = 42$, with the modal bivalent number varying from 14_{II} to 21_{II}; (2) $2n = 40$, modes at 18_{II} and 19_{II}; (3) $2n = 41$, modes at 18_{II} and 19_{II}; (4) $2n = 43$, mode at 20_{II}; (5) $2n = 44$, modes at 18_{II} and

21_{II}; and (6) $2n = 47$, mode at 19_{II}. Detailed discussions of the genomic constitution of the various hybrid types are included.

1358 Fox, S. W. & Fontaine, D. D.
Sequential assays of 4 amino acids in grains of wheat, rye, and of their hybrid.
Proc. Soc. exp. Biol., NY 1956 : **92** : 503–06.

Grains of wheat, rye and a wheat-rye hybrid were analysed for leucine, lysine, methionine and phenylalanine. "The assays have included total, N-terminal N-penultimate and C-terminal proportions of these amino acids. In all cases, only lysine is N-terminal. C-terminal assays permit the conclusion that this lysine is all terminal, and not free. The proportions of total lysine and N-lysine in the hybrid are intermediate between the values in the parent strains. The comparable result for leucine is not intermediate."

1359 Bondarenko, G. K.
(Winter amphidiploids).
Priroda (Nature), Leningrad 1958 : No. 10 : 96–98.

Mention is made of wheat-rye amphidiploids bred at Dnepropetrovsk and some high yielding families with large grain rich in gluten which have been selected from them in recent years. The use of a pollen mixture of rye varieties for pollinating wheat, e.g. Ukrainka 246 ♀ x (Har'kov 194 + Veselyj Podol + Voronežskaja SHI [Verenež Agricultural Institute]) ♂ was one of the methods employed. The best among the amphidiploids is Dnepr. It arose by spontaneous hybridization between the winter wheat Hostianum 237 and the winter rye Har'kov 194. The chromosome doubling is attributed to prolonged exposure of the grains of the parental varieties to temperatures of − 10° C. Selected families of Dnepr have long ears, with as many as 22 spikelets each, a high degree of fertility, firm culms, large grain, winter hardiness and immunity to many fungi and insects.

1360 Pugsley, A. T.
Albino mutation in common wheat.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : p. 12.

An F_6 plant of the cross Federation x Normandie produced two leaves, each with a narrow white stripe; this plant was found to be heterozygous for albinism. The striping appeared to be the result of a somatic mutation of a normal allele. A population of a back-cross derivative of (Iumillo x *Aegilops squarrosa*) x Javelin 6 segregated into green and albino plants in a ratio of seven to three. The albino plants were similar to those mentioned above. It was found that these two albino mutations took place at the same locus as a similar mutation detected in 1953 in the F_4 of the cross Federation x Normandie.

1361 Matsumura, S.
Effects of temperature and irradiation time upon mutations induced by radiations.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 5–6.

Treatments with X and γ rays of 10 and 20 kr. were given to dormant seeds of *Triticum monococcum* var. *flavescens*. After acute irradiation the seeds were either sown immediately or stored for 30 days at 20° C. or 5° C. The effect of β radiation by P^{32} was also investigated. It was found that the frequency of ears with chromosome aberrations in X_1 plants was considerably higher after treatment at 20 kr. than at 10 kr.; the effect of γ rays was generally stronger than that of X rays. Irradiation immediately before sowing and 30-days storage at low temperature produced more aberrations than storage at room temperature after irradiation. The frequency of chlorophyll mutations in the X_2 increased with the radiation dosage. Only slight effects of β irradiation were noted but the dose used was very low.

1362 Misra, G.
Photoperiodic response of some newly evolved strains of wheat.
Bull. Torrey bot. Cl. 1958 : **85** : 347–58.

The wheats studied comprised the X-ray-induced mutants R–1 and R–9. Long days (24 hr.) shortened the vegetative period and short days (8 hr.) lengthened it, compared with control treatment under natural conditions at Allahabad. The greater degree of earliness or lateness in heading was observed in plants which were respectively the youngest at the time of commencement of the long-day or short-day treatments. Long days had an adverse effect on grain yield; short days exerted a beneficial influence on some components of yield but did not result in any marked increase in yield. The mutants therefore follow the general trend in photoperiodic behaviour shown by other Indian wheats.

1363 Fujii, T.
Crosses between various X-ray induced recessive mutants in wheat.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 10–11.

The mutant strains of *Triticum monococcum* vars.

flavescens, *basi-viridis* II, *virido-albina* and slender and iregular ear, were crossed with one another. It was found that the chlorophyll content of double recessive plants from the cross *virido-albina* x *chlorina* was slightly less than that of *virido-albina* itself, in the seedling stage. When placed in a phytotron at 20° C. and 80% relative humidity, the chlorophyll content of the leaves was restored to that of the *chlorina* level. Double recessive seedlings from the cross *virido-albina* x *basi-viridis* had no chlorophyll and died a fortnight after germination, even in the phytotron. The chlorophyll content of the leaves of other double recessives from crosses between *virido-albina* and slender or irregular-ear mutants was similar to that of *virido-albina* itself. In the phytotron, the chlorophyll content of these crosses was restored to that of normal plants. The *virido-albina* gene is believed to be hypostatic to the *chlorina* gene, a similar relationship being found between the *basi-viridis* and *chlorina* genes. *Albina*-like plants from the cross between *virido-albina* and *basi-viridis* II are thought to be genetically different from true *albina* mutants.

1364 Pal, B. P., Sikka, S. M., Swaminathan, M. S. & Natarajan, A. T.
Frequency and types of mutations induced in bread wheat by some physical and chemical mutagens.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : 14–15.

Seeds of C–591, a stable and homogeneous wheat variety, were irradiated with X rays, fast neutrons and β particles from P^{32} and S^{35}; other seeds were soaked in groundnut, castor or mustard oil. When M_2 progenies were screened for mutations, it was found that: (1) a high frequency of viable mutations was induced by radioactive-isotope and groundnut-oil treatments; (2) X ray treatment of 16,000 r. yielded a higher percentage of mutations than treatment of 11,000 or 22,000 r.; (3) with two exceptions, the same type of morphological mutation occurred after all the treatments; and (4) a large proportion of the viable mutations were in each case speltoids. An *albina* mutation was found only after fast-neutron treatment; a completely beardless mutant was induced with groundnut oil, this change being associated with a reduction in tillering. The treatment with radioactive isotopes yielded several chimeras and haploid plants with $2n = 21$. Crosses have been made between normal C–591 and the mutant forms; also cytological investigations of the mutants are under way. [Cf. 1117].

1365 Yamashita, K. & Okuda, M.
X-ray induced mutations in einkorn wheats II. Pigment analysis.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : 3–4.

The results are reported of studies on pigmentation in *chlorina*, *carotina* and *albino* mutants of *Triticum monococcum*, these mutants being the result of X irradiation.

1366 Meletti, P.
Risultati di un trapianto di embrioni fra cariossidi di due razze colturali di grano. (**Results of embryonic transplanting between caryopses of two cultivated wheat varieties**).
R.C. Accad. Lincei : Ser. 8 : 1957 : **22** : 209–16.

The two *Triticum vulgare* lines Albimonte and F51 were used, embryos of the former being grafted on to caryopses of the latter from which the embryos had been removed. Most of the plants obtained were normal Albimonte types but one was exceptional in combining the pigmentation, plant height and awned character of Albimonte with the general spike form of F51, while remaining distinct in rachis length, number of spikelets, spike density, awn length, and number, weight and length of the caryopses. The new form remained stable during the three generations studied and an almost identical form was obtained by repetition of the experiment. Among sexual hybrids, neither the F_1 nor any of the F_2 segregates resembled the vegetative hybrid.

1367 Agaev, M. G.
(The heterogeneity of spring-wheat plants within a variety).
Agrobiologija (Agrobiology) 1958 : No. 2 : 72–75. [Russian].

Experiments at Puškin and Mahačkala showed that pure varieties of wheat such as Diamant [Diamond], sown at unaccustomed dates or grown in short days or under drought conditions, gave progenies differing with regard to drought resistance and mode of development. This variability is attributed to differences in external conditions.

1368 Deržavina, A. V. & Vasil'eva, M. I.
(New winter-wheat varieties obtained from spring wheats).
Agrobiologija (Agrobiology) 1958 : No. 3 : 118–19. [Russian].

An account of training the spring wheats Moscow and Diamant [Diamond] for the winter habit on an experimental farm in the Kalinin province is given. The new winter variety derived from Moscow, designated Kalinin 4, has a longer ear than the winter standard Lutescens 116 which it outyields by 5·4 c. per ha. It also develops more grains per ear and the grain is larger. The winter form of Diamant has larger grain than the standard and yields 2·7 c. more per ha.

1369 MANZJUK, V. T.
(The formation of some morphological characters in spring-wheat hybrids).
Agrobiologija (Agrobiology) 1958 : No. 3 : 65–68. [Russian].

The progenies of some hybrids differed with regard to the size of epidermal leaf cells, branching habit, pubescence of the glumes or awn colour, depending on whether they had been raised on irrigated or unirrigated ground. The majority of plants resembled the parent most favoured by the environment in which it was grown.

1370 ZLYGOSTEV, M. JA.
(The results of utilizing the method of altering spring wheat into winter wheat in breeding).
Agrobiologija (Agrobiology) 1958 : No. 2 : 23–26. [Russian].

An account of training the spring wheats Tulun 70, Diamant [Diamond] and Kahetinskaja Vetvistaja [Branched Kahetian] for the winter habit at Falenki is given. The results include a winter form of Tulun 70, now in the fourth generation, which is hardier and more productive than the winter-wheat standard Lutescens 116. The new variety is being multiplied. In addition to this, third generation hybrids between unidentified winter wheats and forms which have acquired the winter habit are now available. These also outyield Lutescens 116 and are exceedingly hardy.

1371 HOVANSKIJ, N. N.
(The effect of sowing before winter upon the progeny of winter wheat).
Agrobiologija (Agrobiology) 1958 : No. 3 : 123–25. [Russian].

The winter variety L'gov 873, sown on 16 October, gave rise to some spring forms. These tillered less than the parent variety and failed to overwinter when sown as a winter crop, but developed well in spring sowings. The spring plants belonged to vars. *lutescens*, *ferrugineum*, *caesium* or *erythrospermum*, the parental soft-wheat variety. In addition to these there were two hard wheat plants of var. *hordeiforme*.

1372 DOLGUŠIN, D. A.
(A description of phasic development of winter wheat under conditions of autumn sowing).
Agrobiologija (Agrobiology) 1958 : No. 3 : 19–33. [Russian].

Vernalization studies of wheat at Odessa are reported and discussed in relation to transforming spring into winter cereals. It is thought that the plants acquire the winter habit through photosynthesis under autumn conditions.

1373 Ny kveitesort. **(New wheat variety).**
Norsk Landbr. 1958 : No. 18 : p. 405.

A sister line of Norrøna, probably to be released in Norway under the name Norrøna II, has yielded 2–3% more than Norrøna in Møystad and other districts and has slightly stronger straw.

1374 HEYNE, E. G.
Registration of improved wheat varieties XXII.
Agron. J. 1958 : **50** : 686–90.

Registered by the US Department of Agriculture in cooperation with the American Society of Agronomy, the following varieties are described: Crockett [XXVII, 284], Lee [XXI, 979], Minter [XX, 191], Rushmore [XX, 193], Taylor [XXIV, 1810], Triumph, Anderson [XXII, 1806], Columbia [XXVII, 2650], Bison [XXVII, 1621], Ponca [XXII, 1096] and Taylor 49 [XXVII, 1643].

Triumph is a hard red winter wheat developed by a farmer in Oklahoma and distributed by him about 1940. It has been certified in Oklahoma since 1947 and in Kansas since 1948. Its advantages are early maturity, short stiff straw, good test weight, good yield in its area of adaptation, loose-smut resistance and tolerance of streak mosaic.

1375 FAJERSSON, F.
Höstvetesorter för Götaland. **(Winter wheat varieties for Götaland).**
Weibulls ill. Årsb. 1958 : 3–5.

The characteristics of Eroica II, Skandia IIIB, Banco [XXIII, 1847] and Svale [XXV, 116] are discussed and a new wheat W14410 is mentioned. The last exceeds current commercial varieties in yield, straw stiffness and resistance to shattering, shows satisfactory winter hardiness and very good quality and equals the best varieties in resistance to mildew and yellow rust.

1376 TÉLLEZ MOLINA, R. & GARCÍA POZUELO, E.
Ensayos comparativos de rendimientos de trigos de origen híbridos (1955–56). [**Comparative yield tests with wheats of hybrid origin (1955-56)**].
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 9–60.

Testing of the varieties Aradi (Aragón Z–2–470 x Ridit) and Canaleja [(Yeoman 2 x Krelof) x Gluyas Early] continued [cf. XXVII, 2751] and their multiplication for general cultivation has begun. Canti [Candeal Alcalá (Soria) x Rieti II], Saria (Riale x Pusa 4), Floreal [Candeal Sagra (Soria) x (Florence x Aurore)] and the *Triticum durum* selection Orgaz have done well in different regions. The recent hybrid 447 (Aragón 03 x Micó I) has shown promise.

1377 GURSHAM SINGH, ATHWAL, D. S. & AVTAR SINGH
A new wheat makes its mark in the Punjab.
Indian Fmg. 1958 : **8** : No. 5 : 6–7.

The variety C286 has been developed at the Wheat Breeding Substation, Gurdaspur, Punjab, from *Triticum vulgare* 'C250' x [*T. vulgare* 'C591' x (*T. durum* 'Punjab 1' x *T. dicoccum* 'Khapli')]. In addition to being higher in yielding capacity than C250, it possesses greater resistance to stem and yellow rusts and earlier maturity. C286 is suitable for the submontane region, with the exception of highly fertile soils. It is also expected to prove valuable as a wheat for late sowing under irrigated conditions in the entire state.

1378 SIKKA, S. M. & SRINIVASAN, V. K.
Rust-resistant N.P. 200 wheat is a high-yielder too!
Indian Fmg. 1958 : **8** : No. 5 : 9–10.

Compared with the local wheat from which it has been selected at the Wellington Wheat Breeding Substation, Nilgiri Hills, *Triticum dicoccum* 'NP200' has the advantages of resistance to leaf rust and higher yielding ability, grain husk ratio, 1000-grain weight and protein and gluten contents.

1379 Novità granarie "Michahelles" 1958. (**New wheats by Michahelles in 1958**).
Sementi elette 1958 : **4** : No. 5 : 51–52.

Two releases are described.
Generoso fam.7 is a winter bread wheat, similar to Generoso [cf. XXV, 932] but is more resistant to cold, more uniform in the ear and more productive; it has given grain yields of 46–58 c. per ha.
Stirpe C 2–6–1 [Line C 2–6–1], a hybrid of Mara, has strong straw 65–70 cm. tall, very free from lodging; it combines high yield with good baking quality.

1380 JAIN, H. K.
Correlated failure of synthetic activities in a wheat chromosome.
Nature, Lond. 1958 : **182** : 1458–59.

In some X_2 plants of the wheat New Pusa 797 showing X-ray induced breakage in the PMCs, a fragment was closely associated with the nucleolus in a high proportion of the cells. The consistency with which this association was observed suggested that the nucleolar-organizing region of one of the nucleolar chromosomes may have formed part of the fragment. This possibility was supported by the presence of a constriction in the fragment and of a heteromorphic bivalent close to the nucleolus, and by observations on root tips of X_3 seedlings, in some of which only three chromosomes with secondary constrictions were found, in contrast to the four invariably seen in control material. In some of the plants showing the association, a single chromosome or pair was retarded in prophase condensation in a few of the PMCs. It was not possible to establish the identity of the retarded chromosome. Earlier work on *Lolium perenne* suggests however that the chromosome was the one which had its nucleolar-organizing region removed by breakage [cf. XXVII, 4088]. If it is accepted that the retarded chromosome was the one which had failed in its nucleolar synthesis, it follows that nucleolar formation and chromosome condensation are related phenomena.

1381 RILEY, R. & CHAPMAN, V.
Genetic control of the cytologically diploid behaviour of hexaploid wheat.
Nature, Lond. 1958 : **182** : 713–15.

Crosses of the 41-chromosome monosomic line HH, which is derived from *Triticum vulgare* 'Holdfast' and resembles other monosomics in meiotic behaviour, with 44-chromosome plants carrying the full complement of wheat chromosomes plus a pair of ryechro mosomes, gave rise to a number of 20-chromosome nullihaploid plants carrying all the wheat chromosomes except that for which HH is monosomic. These nullihaploids exhibited a markedly higher frequency of bivalents and trivalents than did 21-chromosome euhaploids of Holdfast. Similarly, three 40-chromosome nullisomics deficient for the HH pair all had large and frequent multivalents and associated univalents. It is concluded that the HH chromosome is responsible for the inhibition of homeologous associations. A haploid plant with 20 normal wheat chromosomes plus the isochromosome formed from the long arm of the HH chromosome behaved as the euhaploids, and in a 41-chromosome monosomic with 20 pairs of normal wheat chromosomes and an HH chromosome represented only by a telocentric of the long arm, no multivalent formation was observed, suggesting that control of bivalent formation may be restricted to the long arm.

1382 Matsumura, S., Nezu, M. & Koshiba, Y.
Genome analysis of *Triticum georgicum.*
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 7–8.

Interspecific crosses involving *T. georgicum* were cytologically analysed in the F_1, attention being given to chromosome pairing during meiosis in pollen mother cells. F_1 plants were easily obtained in the cross *T. georgicum* x *T. monococcum*; 49% of the cells had the configuration $6_{II} + 9_I$ and 27% had $5_{II} + 11_I$. Pollen and seed fertility was very low. In the combinations *T. georgicum* x *T. turgidum* and *T. durum* x *T. georgicum* the percentage of seed formation was high. Chromosome pairing was regular; the percentage of cells having 14_{II} was 98% and 82% respectively. The cross *T. georgicum* x *T. vulgare* was not easily effected; in 82% of the cells, the chromosome configuration was $14_{II} + 7_I$. Poorly developed sterile hybrids came from the combination *T. georgicum* x *T. timopheevi*. One or more trivalents occurred in 86% of the cells and in 41% the configuration was $12_{II} + 4_I$. The chromosomes of *T. georgicum* did not seem to be homologous with those of *T. timopheevi*. It was concluded that *T. georgicum* belongs to the Emmer group of wheats and has the genome formula AABB.

1383 Matsumura, S. & Fujii, T.
Genetic effect of ionizing radiation in Einkorn wheat.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 8–9.

Treatments with X rays, γ rays and fast neutrons were given to dormant seeds of *Triticum monococcum* var. *flavescens*; the resulting effects on germination and seedling growth are reported. It was found that the mean single-spike fertility of X-irradiated plants decreased with a decrease in wave length; similar relations were found between the frequency of chromosome aberrations or chlorophyll mutations and wave length. However at 20 KVP the aberration frequency was unexpectedly high and at 50 KVP it was much lower. Chromosome aberrations increased in proportion to the dosage of γ rays and neutrons.

1384 Cauderon, M. Y.
Étude cytogénétique d'un hybride trigénérique impliquant *Triticum dicoccum*, Schrank, *Agropyrum intermedium* Host. P.B. et *Secale cereale* L. **(A cytogenetic study of a trigeneric hybrid involving *T. dicoccum* Schrank, *A. intermedium* Host. P.B. and *S. cereale* L.).**
Bull. Soc. Pharm. Bordeaux 1957 : **96** : 145–47.

Attempts were made to cross the two amphidiploids, *T. timopheevi* x *A. intermedium* and *T. dicoccum* x *A. intermedium* with diploid *S. secale* used as the pollen parent. In the former case, six seeds were obtained from the 104 flowers pollinated but no progeny was raised. Five seeds were gained from 288 pollinations in the second case; five hybrids were raised. These plants had chromosome numbers of $2n = 42$, 14 chromosomes having been obtained from *Triticum*, 21 from *Agropyron* and seven from *Secale*. Root-tip nuclei at interphase showed the chromocentric structure characteristic of *Secale*. Meiotic behaviour was studied in one hybrid; the average metaphase configurations of 100 cells were $34{\cdot}26_I + (2{\cdot}95_{II}d + 0{\cdot}08_{II}a) + 0{\cdot}56_{III}$. There were 0·56 chiasmata per conjugated chromosome. These results were compared with those of the F_1 of *T. dicoccum* x *A. intermedium*; in this case the average configurations were $24{\cdot}37_I + (3{\cdot}87_{II}d + 0{\cdot}25_{II}a) + 77_{III} + 0{\cdot}02_{IV}$. There was no apparent pairing between the chromosomes of *Secale* and those of the other two species; most of the chromosome associations arose from autosyndesis of the *Agropyron* chromosomes. It was often possible to distinguish the *Secale* chromosomes amongst the univalents.

Other aberrations typical of intergeneric hybrids were also observed.

The hybrids were completely sterile even under conditions of open pollination. They showed great vigour; in their habit the hybrids resembled *Agropyron* from which they also inherited certain characteristics of the glume and the property of being perennial. From *Secale* the hybrids had inherited the hairy collar of the ear. In their late ripening, they resembled both *Triticum* and *Agropyron*. In other ear characters the hybrids were intermediate between the parent forms.

1385 HAUN, C. R. & SCHULZ-SCHAEFFER, J.
Establishment of a monosomic series of Yogo winter wheat.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : p. 16.

At Montana State College, crosses were made with a view to transferring the monosomic condition from an aneuploid series of Chinese spring wheat to Yogo wheat. The F_1 hybrids were examined cytologically and those presumed to be monosomic were back crossed to Yogo. Back crossing is to be continued until a series of Yogo, monosomic for each of the 12 chromosomes, has been obtained. The aneuploid Yogo series will be used in a chromosome substitution programme with other winter varieties, the aim being to determine which chromosomes carry factors affecting quality and agronomic characters. Chromosomes carrying desirable factors will be combined in a winter variety suitable to Montana conditions.

1386 TSUNEWAKI, K.
Differential behavior of wheat chromosomes in monosomics: their transmission and radiosensitivity.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1269 : p. 1226. (Abst.).

Experiments were carried out (1) to determine the frequencies of monosomics for each chromosome in the progenies of monosomics of Chinese Spring, (2) to compare the radiosensitivity of disomic 10 and monosomic 10, using a wide range of X-ray dosage, and (3) to compare the radiosensitivity of 16 monosomics and the corresponding disomics when subjected to a moderate dose of X rays. All X-ray treatments were carried out with dormant seeds. (1) The monosomics differed considerably with respect to the frequency of monosomics in their selfed progenies. The frequency was highest (89·2%) for monosomic 3 and lowest (52·2%) for monosomic 20. Gamete selection was of importance in determining the rate of transmission of the monosomic condition. Gametes deficient for chromosome 3 or 17 appeared at a greater advantage and those deficient for chromosome 20 or 4 at a greater disadvantage than the average group of deficient gametes. (2) As regards the irreversible effects of X irradiation, monosomic 10 was much more sensitive than the disomic at all developmental stages. The reversible effect of X rays was differential for monosomic 10 only in the earlier stages of development. Several morphological mutants were observed in the X_1, speltoid and awned mutants being the most common. The frequencies of speltoids (chromosome 9) were the same in monosomic 10 and the disomic. The rate of mutation to the recessive condition of awnedness (chromosome 10) was however four times higher in the monosomic. (3) The expression of radiosensitivity of monosomics varied according to the developmental stage of the plants raised from the treated seeds. Monosomic 13 was sensitive but monosomic 2 resistant as indicated by the germination stage. Monosomics 3, 10, 15 and 16 were sensitive and disomics resistant at the first-leaf stage. Monosomics 8, 15 and 19 were sensitive and monosomic 4 and disomics resistant at the tillering stage. These observations suggest that radiobiological study of monosomics may offer a new approach in developmental genetics. Finally attention is drawn to the fact that some chromosomes belonging to the same homeologous group showed a common pattern of X-ray response.

1387 KIHARA, H.
40 years after the discovery of right chromosome numbers of the genus *Triticum.*
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 1–2.

Reference is made to the discovery of polyploidy in *Triticum* by Sakamura and Sax independently, their findings being reported in 1918. Later work on polyploid wheats including the determination of genome types is also mentioned.

1388 MATSUMURA, S., FUJII, T. & KONDÔ, S.
Effect of X- and γ-radiations upon wheat seedlings and their modification due to temperature or polyploidy.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 9–10.

Dormant seeds of diploid *Triticum monococcum*, tetraploid *T. durum* and hexaploid *T. vulgare* were treated with X and γ rays at dose rates of 10–40 kr. With respect to inhibition of germination and seedling growth, the diploid species was most sensitive and the hexaploid most resistant; no significant difference was found between the tetraploid and the hexaploid.

1389 NATARAJAN, A. T. & SWAMINATHAN, M. S.
Haploidy induced by radiations in wheat.
Experientia 1958 : **14** : 336–37.

Seeds and seedlings of *Triticum aestivum* 'NP809' were treated with different doses of X rays, P^{32} and S^{35}, the second generation progeny being screened for the occurrence of haploids. X-ray treatment was only effective in inducing haploidy when the inflorescences were treated prior to anthesis. Irradiation after anthesis yielded many twin and triple embryos and no haploids. Haploids occurred more frequently in the progenies of plants treated with P^{32} and S^{35}; the highest frequency, that is 12 haploids among 9600 plants, occurred when P^{32} was applied to pots at the rate of 50 μc. per 8 lb. of soil just before the initiation of microsporogenesis in the main tiller.

Besides the formation of regular bivalents, secondary associations are known to occur among univalents or between univalents and bivalents in haploid *T. aestivum.* It was found that the Sat I chromosome, which is the longer of the two satellited chromosomes present in the haploid complement, only became associated with other univalents at the distal region; associations involving this chromosome were always of the end to end or side to end types. Sat II did not form any end to end associations. This type of specificity of associated chromosome segments is thought to support the view that heterochromatic affinity or a similar cause may govern the types of secondary associations occurring in polyhaploid bread wheat [cf. XXVIII, 297].

1390 NAGAMATSU, T., IKEDA, H. & TANAKA, S.
(Geographical differentiation in the amylase activity of the germinating seeds of wheat varieties).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 100–04. [Japanese].

Data are provided on the degree of winter habit, erect or prostrate tendency, 1000-grain weight and amylase activity of 65 varieties making up a collection of 142 samples drawn from every prefecture of Japan. Correlations were noted between β-amylase activity, on the one hand, and colder region of origin and degree of winter habit, on the other. The activity of α-amylase was not noticeably correlated with provenance.

1391 PILET, P.-E. & STROUN, M.
(Physiological and biochemical changes in soft wheat, induced by embryo grafting).
Agrobiologija (Agrobiology) 1958 : No. **3** : 41–59. [Russian].

[Cf. XXVIII, 4057].

1392 FUKASAWA, H.
Results of genome exchange among *Aegilops* and *Triticum* species through the successive backcrosses.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : p. 24.

Data are provided on the fertility and type of cytoplasm and genome found in a series of plants derived from crosses between *Triticum* and *Aegilops*, similar information being given for the parent forms.

1393 WRIGHT, G. M.
Effect of gibberellic acid on a compactoid wheat.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : 12–13.

Gibberellic acid had a marked effect on the total fertility of plants of a tetrasomic compactoid wheat [cf. XXVIII, 4066]; plants which had received one treatment with gibberellic acid were more fertile and those which had two treatments were less fertile than the controls. The correlation coefficient for initial dose and start of flowering was 0·92, the correlation being lower for later flowers. Responses to gibberellic acid in other characters were also noted. These results are not considered to be conclusive.

1394 FUKASAWA, H.
Fertility restoration of cytoplasmic male-sterile Emmer wheats.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : p. 21.

Male-sterile *Triticum dicoccum* 'Khapli' was crossed with *T. dicoccoides* var. *kotschyanum*; the F_1 progeny were of vigorous habit and showed high pollen fertility. From selfing or back crossing to Khapli, F_2 progenies of varying male fertility were obtained; they were classified in five classes according to the percentage of fertile pollen produced. Pollen fertility of semi-sterile plants was greatly influenced by environmental conditions. It is suggested that at least two genes from *T. dicoccoides* are involved in the restoration of pollen fertility.

1395 MOCHIZUKI, A. & SAKURAI, N.
The number of the chloroplasts in the stomatal guard cells of *Triticum* and *Aegilops*.
Wheat Inform. Serv. Kyoto 1958 : No. **7** : 17–18.

The number of chloroplasts in the stomatal guard cells was counted in 14 species and some interspecific hybrids of *Triticum* and nine species of *Aegilops*. It was found that the number of chloroplasts increased with autoploidy but not with alloploidy; the Emmer group had values smaller than those of the other wheats. *T. dicoccoides* var. *spontaneonigrum* and *Ae. bicornis* had numbers differing from those of other species in their particular genome groups. The numbers of the hybrids were either intermediate between those of the parents or higher.

1396 ČINOJ, D. D. [CHINOY, J. J.] & ŠARMA, Š. N. [SHARMA, S. N.].
(Development of the kernel in cereals. II. Varietal differences in the process of grain filling and desiccation as affected by temperature).
Agrobiologija (Agrobiology) 1958 : No. 2 : 53–65. [Russian].

In continuation of previous researches [XXVIII, 1526], the relation between temperature during the growth season and grain weight has been investigated. It is concluded that external conditions are mainly responsible for under-developed or empty grain, not genes as has been held in the past.

1397 SAMOGGIA, V.
Ridimensionare, ma migliorare la qualità del frumento. (**Reduce the acreage but increase the quality of wheat**).
Sementi elette 1958 : **4** : No. 5 : 32–36.

Italy having attained self sufficiency in wheat production, greater attention will be given to quality and all the hybrids bred at the plant breeding institute at Bologna are analysed for gluten content and quality and subjected to baking tests. The techniques used in these analyses are described briefly. Experience shows that the results, though influenced to a certain degree by growth conditions, are consistent from year to year and are an expression of the genetic constitution of the lines. The variety Fiorello [cf. XIX, 628] and line IBO1373 from Fiorello x Lauro Bassi are characterized by high content and quality of gluten, in both of which they surpass all other varieties of bread wheat grown in the Po valley. Other selections are higher still but not so good in yield and are being used as parents.

1398 POP, E.
Însușirile de panificație și puterea de îmbunătățire a unor linii de grîu de toamnă de la Stațiunea de Cercetări Agronomice Cluj (1951–1956). (**The baking characteristics and improving capacity of some winter-wheat lines of the Cluj Agronomic Experimental Station, 1951-56**).
Stud. Cercet. Agron. Cluj. 1957 : **8** : 272–82.

Baking tests of eight Cluj lines are reported. Two of these, Cluj 51–463 and Cluj 51–465, both from (A15 x Odroș) x Fleischmann 481, are recommended both for high baking quality when used alone and for high capacity for improving when blended with other varieties.

1399 EVERSON, E. H. & SEEBORG, E. F.
The heritability of milling quality in wheat as measured by the separation of the bran and endosperm.
Agron. J. 1958 : **50** : 511–13.

The experiment described was conducted at Pullman, Washington, with a cross between two winter wheats, the soft red Norin 10 [Ministry of Agriculture and Forestry 10] x Brevor–14 and the white variety Burt; the former was of poor milling quality and the latter of good quality. A high bran weight was taken to indicate poor milling quality. Bran weights were determined for the parent varieties, the F_1 and F_2 progeny and the back cross to both parents. It was found that the parent wheats differed by more than four major factors controlling the separation of bran from the endosperm; the exact number of factors could not be determined by the partition method of genetic analysis. Milling quality had a heritability of 35·50%. Estimates of expected genetic gain for this character indicated that by means of recurrent selection good progress could be made in improving milling quality.

1400 JAKUBCINER, M. M.
(Endemic wheats from Tibet).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 54–56. [Russian].

The wheat collection of the Institute of Plant Industry was enlarged in 1955–1957 by 80 new Tibetan forms and a study of these at many branches of the institute indicates that some of them possess value as material for breeding or studies of the geography and systematics of wheat. Of particular interest are Western Tibetan forms from Čendu (3100 m.) and the basin of the river Nuczjan. They are 28-chromosome spring wheats, identified as *Triticum turgidum* ssp. *montanum*, with straw 10 cm. shorter than Diamant [Diamond], and adapted to mountainous climatic conditions. The grain is mealy, less frequently semivitreous, and the 1000-kernel weight is 40–45 g. The form from Nuczjan ripens earlier than that from Čendu and both ear 25 days later under 14 hr. days at Puškin. Other uncommon forms of *T. turgidum*, characterized by high productivity, were found at elevations of 3560 and 3700 m. An endemic montane form of *T. polonicum* was found at Netong (3560 m.) and at Nuengo-Samue (3600 m.). Some of the *T. vulgare* forms were collected at even higher elevations, for instance at Pedi (4400 m.). Some of the soft wheats sown at

Puškin in 1957 were characterized by semi-winter habit. Most Tibetan wheats were found to be populations comprising 4–7 different forms. Most of these were *inflatum* forms with compact ears morphologically distinguishable from the Irano-Turkestan wheats, *furcatum* forms and forms intermediate between vars. *speltiforme* and *inflatum*. Some *T. vulgare* forms with compact ears other than var. *inflatum* also occurred; these resembled *T. durum* morphologically. Among the awnless forms of soft wheat, some referred to as convar *eumuticum* did not have even rudimentary awns. Previously unknown forms pertaining to vars. *subpseudobarbarossa-inflatum*, *cinereoinflatum*, *subreconvatum**, *pseudohostianum* and *inflatum* are reported. The characteristics of the Tibetan soft wheats of interest to the breeder are: cold resistance; firm envelopment of the grain by the glumes and yet good threshability; many florets and grains in the spikelet, especially in the compact-eared *inflatum* forms; and short straw, in most wheats not exceeding 50–60 cm. All the forms are highly photosensitive and under 14 hr. days earing was delayed by 25–45 days. Most are tolerant of aerial drought but require moist soil and are, with a few exceptions, midseason or late types. Forms designated 41911, 41912, 41914, 41917 and 41934 proved early in autumn sowings under irrigation in the south of the USSR, while others, for instance 41908, eared earlier than the standard varieties both when sown as a spring crop in the north or as a winter crop under irrigation in Uzbekistan.

1401 Asana, R. D., Saini, A. D. & Ray, D.
Studies in physiological analysis of yield III. The rate of grain development in wheat in relation to photosynthetic surface and soil moisture.
Physiol. Plant. 1958 : **11** : 655–65.

Three varieties of wheat were used in these studies, some of the plants being subjected to intermittent drought either slightly before or after anthesis. It was found that after leaves and stems had yellowed, the rate of increase in grain weight was larger under normal water supply than under drought, a greater increase in 1000-grain weight being observed. This increase was associated with slower yellowing of the ear, suggesting that photosynthesis in the ear plays an important part in grain development. A difference in grain weight between two of the varieties grown under drought also appeared to be associated with differences in the green surface area of the ear. Differences in grain yield due to variety or water level were not closely associated with leaf and stem surface. It is suggested that variability in rate of yellowing of the ear might be utilized in breeding varieties suitable for nonirrigated conditions. [Cf. XX, 1558 and XXV, 1882.]

1402 Asana, R. D. & Saini, A. D.
Studies in physiological analysis of yield IV. The influence of soil drought on grain development, photosynthetic surface and water content of wheat.
Physiol. Plant. 1958 : **11** : 666–74.

The 1000-grain weight of the variety PbC281 was found to exceed that of NP720 under normal water supply and drought only during the last week of the maturation period, when the ear of PbC281 was greener than that of NP720, the leaves and stems of both being yellow. This result supported the view that photosynthesis in the ear is important in determining yield [cf. 1401]. Grain setting was reduced by drought in the varieties studied. It is suggested that it would be useful to find out whether varieties show differences in the effect of drought on grain setting. A high grain-number and an ear with a longer functional period are considered to be desirable attributes for varieties to be grown without irrigation.

1403 Kobel, F.
Fragen der Resistenzzüchtung bei Weizen. (**Questions of breeding for resistance in wheat**).
Schweiz. landw. Z. 1958 : **86** : 749–54.

Common methods used in breeding for resistance to disease are surveyed, reference being made to a number of fungous diseases.

1404 Popow, G.
Sommerweizenzüchtung. (**Breeding spring wheat**).
Schweiz. land. Z. 1958 : 754–60.

The primary aim of Swiss breeders is to increase the yielding capacity of spring wheats; improvement in standing capacity and quality is also important. In addition other characters which may influence the yield under certain conditions are being considered. Brief accounts are given of some current breeding work for increased yield and resistance to *Puccinia graminis* and *Septoria*; the organization of breeding work at Lausanne and Zürich-Oerlikon is outlined.

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* ? *subrenovatum.*

1405 WAGNER, S.
Probleme der schweizerischen Getreidezüchtung, dargestellt am Winterweizen. **(Problems of Swiss cereal breeding, illustrated by winter wheat).**
Schweiz. landw. Z. 1958 : **86** : 744–49.

The general difficulties met when improving wheat are discussed; for example the requirements of growers and industry are continually changing. Mention is made of the programme of work for 1958 of the Plant Breeding Department of the Agricultural Station at Zürich-Oerlikon. Attempts are being made to produce a form of the variety Probus which is resistant to *Puccinia triticina*, to develop from Probus a more rigid and productive variety and to produce a wheat similar to Capelle but more vigorous. Investigations are needed to find out whether an increase in grain yield can be accompanied by an increase in the yield of protein; in this connexion it is necessary to know whether there is any correlation between grain size and protein content. Before such investigations can be attempted at Zürich-Oerlikon, a quick and efficient method of estimating nitrogen must be found. Yet another problem for the breeder is the development of varieties resistant to foot rots caused by *Cercosporella*, *Ophiobolus* and possibly other pathogens; in this connexion, suggestions are made for a better organization of work of this kind in Switzerland.

1406 HEBER, U.
Ursachen der Frostresistenz bei Winterweizen. I. Mitteilung. Die Bedeutung der Zucker für die Frostresistenz. **(Causes of frost resistance in winter wheat. I. The significance of sugars for frost resistance).**
Planta 1958 : **52** : 144–72.

The sugar content of the leaves at various stages of development was investigated in three varieties, known to differ in their response to frost; some of the plants were allowed to harden normally at low temperatures and others were kept at 15° C. to prevent winter hardening. Frost resistance was not found to vary directly with the total sugar content in all cases; a closer correspondence existed between the monosaccharide content and frost resistance but this was not a parallel relationship. Other experiments showed that the action of monosaccharide sugar in protecting cytoplasmic protein from frost damage is greater than that of polysaccharides. A discussion of the mechanism of this protective action is included.

1407 HEBER, U.
Ursachen der Frostresistenz bei Winterweizen. II. Mitteilung. Die Bedeutung von Aminosäuren und Peptiden für die Frostresistenz. **(Causes of frost resistance in winter wheat. Part II. The significance of aminoacids and peptides for frost resistance).**
Planta 1958 : **52** : 431–46.

Neither the content of aminoacids nor of peptides was found to have any definite quantitative relation to frost resistance. Aminoacids did not protect plasma proteins against frost but a mixture of peptides of animal origin had some protective action; peptides from the wheat itself could not be tested. If the wheat peptides do have a protective effect, it must be considerably less than that of sugar [cf. 1406].

1408 KISLJUK, M. M.
(Improving the winter hardiness of winter wheat).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 4 : 129–32. [Russian].

The heritable basis of Wilhelmina, Kooperatorka [Cooperator], Ukrainka, Hostianum 237, PPG599 and Poison K–40136 was shattered by various temperature treatments at the Institute of Plant Industry. The progenies of young plants subjected to — 2° C. at the beginning of the vernalization phase showed the highest degree of variability, especially in respect of winter hardiness.

1409 RIMPAU, R. H.
Untersuchungen über die Wirkung von kritischer Photoperiode und Vernalisation auf die Kälteresistenz von *Triticum aestivum* L. **(Investigations on the action of the critical photoperiod and vernalization on the cold resistance of *T. aestivum* L.).**
Z. Pflanzenz. 1958 : **40** : 275–318.

The critical photoperiods necessary for the development of ear primordia were determined for eight winter wheats of different geographical origin, use being made of a special chamber in which climatic conditions could be controlled. Four of these varieties were also studied in the field to determine the effect on development of different photoperiods in combination with various periods of vernalization treatment. Six west European varieties were also investigated in a similar field experiment. The cold resistance of the varieties under the various treatments was also determined.

Marked differences were observed between varieties in respect of the critical photoperiod in the climatic chamber experiment; for three varieties this period was less than 10 hr. In four varieties a positive correlation was found between the length of the critical photoperiod and the resistance to cold.

Increasing day length and increasing the time of vernalization, both of which accelerate development, were accompanied by a reduction in cold resistance in all the varieties studied but the varieties reacted differently to the various photoperiods and vernalization times. Photoperiod had a greater effect on the cold resistance than vernalization; the longer the vernalization the greater was the effect of the photoperiod in decreasing cold resistance.

In the climatic chamber experiment it was found that the variety Harvest Queen, with the longest critical photoperiod, showed the least reduction in cold resistance with increasing day length; this character is useful in cases where resistance to spring frosts is required.

As regards the six west European varieties, development under natural short day conditions was most accelerated by giving supplementary light in the middle of the dark period.

The results of these experiments are discussed in relation to the geographical origins of the varieties.

1410 Pfeifer, R. P.
The crosses are made—new wheat to appear.
Sci. Fmr., Pa. 1958 : **6** : No. 1 : p. 11.

Several promising lines of wheat that possess improved straw strength and resistance to disease and Hessian fly are now ready for final selection at the Agricultural Experiment Station of Pennsylvania State University; wheats adapted to Pennsylvanian conditions were used in developing these lines.

1411 Chevalier, R.
Échaudage chez les blés tendres et poids de mille grains. (**Scorching in soft wheat and thousand-grain weight**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 413–30.

Tabulated information is provided on the earliness, susceptibility to rusts and seed appearance of a large number of wheat varieties studied at Montpellier. Also recorded are the maximum 1000-grain weight (P) attained by each variety during the years 1947–57 and the "ponderal deficit" for every variety in each of these years, this value being calculated by the formula $D = \frac{P - p}{P} \times 100$, where p is the 1000-grain weight for the year in question. The varieties are also classified according to their tendency towards scorching of the grain, this being a physiological disorder. On the whole the early varieties are less susceptible to scorching than the later varieties. Nevertheless it is thought that it will be possible to breed productive and fairly late varieties which are suitable for regions other than in the South of France and also fairly resistant to scorching. Varieties are listed which might be useful in such a breeding programme on account of their valuable characteristics, including rust resistance.

1412 Poliščuk, V. K.
(**Improving the resistance of winter wheat to loose smut by means of cross pollinations**).
Visn. Akad. Nauk Ukrajin. RSR (Rec. Ukrain. Acad. Sci.) 1958 : No. **2** : 60–61. [Ukrainian].

Selected progenies from intervarietal and intravarietal cross pollinations of Lutescens 17 and Ukrainka showed improved resistance to *Ustilago* under conditions of natural and artificial infection.

1413 Gaskin, T. A.
Developmental and genetic bases of resistance in wheat to loose smut.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1777 : p. 1955. (Abst.).

Studies of invasion by *Ustilago tritici* were made on six winter wheats. Knox, a susceptible variety, showed a slight, gradual decline in amount of fungus from seed to maturity. In Hope-Hussar, the fungus was unable to invade the embryo after infecting the pericarp and endosperm. Kawvale and Tremezino both had a high percentage of infected embryos but the fungus failed to maintain itself at the growing point, so that the heads were free from smut. Rietti* was similar, but its resistance was not complete. PI191533 was completely susceptible prior to the two-week stage, after which it became resistant.

The resistance of the embryo in Hope-Hussar appeared to be derived from Yaroslav and was effective against cultures of only four of the 14 races tested. No chemical substance accounting for resistance could be detected.

In reciprocal crosses of the five resistant varieties with Knox, a decrease in incidence of smut was observed when Tremezino or Rietti was used as female parent, indicating an effect of the maternal tissue. Resistance was recessive in all crosses, being conditioned by one factor pair in Hope-Hussar and PI191533 and by two in Kawvale, Tremezino and Rietti. The resistance factor of PI191533 differed from those of Tremezino and Rietti.

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* ? Rieti.

1414 Rod, J.
Geneticko-fysiologická studie resistence pšenic proti sněti prašné. I. Umělé infekce, jejich technika a spolehlivost. **(A genetical and physiological study of wheat resistance to loose smut. I. Artificial infection, methods and their efficacy).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1958 : **31** : 493–508.

In this article, dealing mostly with methods of artificial infection, differences in seed set and 1000-grain weight after infection of resistant and susceptible varieties are mentioned. A resistant variety such as Peragis set fewer infected grains than susceptible varieties, infected grains having a lower 1000-grain weight than healthy grains; in susceptible varieties, infected grains had a higher 1000-grain weight than healthy ones.

1415 Ward, D. J.
World collection of wheat. Data compilation No. 3: Notes on reactions to races of common bunt, *Tilletia caries* and *T. foetida*, and time of maturity for 8,250 common wheats grown at Pendleton, Oregon.
US Dep. Agric., Agric. Res. Serv., Crops Res. Div., Pl. Industr. Sta., Beltsville, Md. undated : unpaginated. (Mimeographed).

Data on reactions to races T1, T2, T13, T15, T16, L2, L7 and L8 are summarized. A table listing the wheats which may be of value as sources of bunt resistance is included.

1416 Jaff, A. H.
Inheritance of resistance to physiologic races T-8, T-16, and T-17 of *Tilletia caries* (DC.) Tul. in hybrids of (27-15 x Rio-Rex-selection 53) and Elgin wheat.
Diss. Abstr. 1958 : **18** : Publ. No. 24,638 : 369–70. (Abst.).

Studies of resistance to *T. caries*, in the above mentioned hybrids, were carried out at Pendleton Branch Experiment Station, Oregon. Data from the F_2 and F_3 progenies were analysed. These results indicated that resistance to race T–8 is controlled by two major genes, one dominant and the other recessive; these genes are linked with 16% crossing over. It seems probable that the dominant gene is either the Turkey or Rio gene identified by other workers and that the recessive gene is the Ridit gene. The inheritance of resistance to T–16 and T–17 is said to be conditioned by two major genes and one or two modifiers, with different levels of susceptibility in each race. One of the major genes may be the Martin 1 gene and the other is probably the Ridit gene. Inheritance of resistance to the three races studied was not related to the inheritance of spike density and awnedness.

1417 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Specializzazione fisiologica di razze di ruggini dei cereali isolate da materiale italiano raccolto durante l'annata 1956. *Puccinia recondita* Rob. ex Desm. [= *P. rubigovera* (DC.) Wint. f. sp. *tritici* (Erikss.) Carl.]. **(Physiological specialization of cereal races isolated from Italian material collected during the year 1956. *P. recondita* Rob. ex Desm. [= *P. rubigo-vera* (DC.) Wint. f. sp. *tritici* (Erikss.) Carl.]).**
Ann. Sper. agr. 1958 : **12** : No. 4 : Suppl. : ix-xiv.

Seventy-two isolates were collected, representing 39 races. Race 1 was the most frequent (11·1%); twelve races, 170–81, are new.

1418 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Specializzazione fisiologica di razze di ruggini dei cereali isolate da materiale raccolto durante la stagione 1956. *Puccinia graminis* var. *tritici* Erikss. et Henn. **(Physiological specialization of the cereal rust races isolated from material collected during the season 1956. *P. graminis* var. *tritici* Erikss. et Henn.).**
Boll. Staz. Pat. veg. Roma 1957 : **15** : 195–200.

From 154 isolations made in different parts of Italy in 1956, 50 races were identified, 11 of them being previously unknown. The most prevalent races were 21, 75, 34, 107 and 16.

1419 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Identificazione di razze fisiologiche di *Puccinia graminis* var. *tritici*, isolate da campioni di frumento raccolto in Italia nel 1957. **(Identification of physiological races of *P. graminis* var. *tritici* isolated from wheat samples collected in Italy in 1957).**
Boll. Staz. Pat. veg. Roma 1957 : **15** : 201–13.

Races 21 and 75 were the most prevalent, whereas race 34 was less frequent than in the previous year [cf. 1418]; race 53, which is also highly virulent and otherwise absent in Europe, also appeared again and race 189 is reported for the first time in Europe.

1420 Orjuela-Navarrete, J.
Variability in reaction of wheats to isolates of races 38 and 48 of *Puccinia graminis* var. *tritici*.
Diss. Abstr. 1958 : **18** : Publ. No. 23,945 : p. 770. (Abst.).

Marquis, Reliance and Kota have been used as standard differentials for races 38 and 48 but in recent years difficulties have been encountered in separating the many isolates of these races from the USA and Central and South America. The reactions of Kota to these isolates have been erratic while those of Marquis have varied according to the temperature and light conditions. Only Reliance has remained reliable as a variety for differentiating the isolates into two major groups, respectively corresponding to the original concepts of races 38 and 48. It is highly resistant to isolates designated race 48 standard and race 48A, and susceptible to race 38 and races previously assigned to a 38–48B race complex. Only one isolate, 48B, remains in a doubtful position on the basis of Reliance, which is only moderately resistant to this isolate and gives an intermediate reaction under some environmental conditions. Kanred, which was replaced by Reliance as a standard differential, is highly resistant to race 48 and susceptible to race 38 and also to isolate 48B. A clear-cut separation of the two major groups may be achieved by means of Rescue which, over a wide range of temperature (66°–87° F.), is highly resistant to race 48, susceptible to race 38 and moderately resistant to 48B. Thatcher and Newthatch are about as reliable as Rescue as differentials, except that the reactions of Newthatch are variable and sensitive to temperature. Timstein is immune from 48B and susceptible to 48 and 38. Subraces occur within races 38 and 48. Frontana is valuable for separating subraces within both 48 and 38. Bola Picota, McMurachy, Cadet, Bockveld and EW47–7227 are useful for differentiating subraces of race 48 under specific environmental conditions.

1421 Watson, I. A. & Luig, N. H.
Timvera—a Steinwedel x *Triticum timopheevi* derivative.
Agron. J. 1958 : **50** : p. 644.

Timvera, a selection from Steinwedel x *T. timopheevi*, is a bearded variety with white grain and white chaff. It is very late maturing and not suitable for commercial cultivation in Australia. Timvera shows high resistance to many strains of stem rust present in Australia but has not inherited all the genes for resistance carried by *T. timopheevi*. It resembles the Wisconsin material CI12632 and CI12633 in respect of stem-rust resistance. Resistance to strain 21 (Anz2) seems to be under the control of similar genetic systems in Timvera and CI12632. Also Timvera, two sibs of Timvera and CI12632 show the same adult plant reactions to *Puccinia rubigo-vera* subsp. *tritici*, when each is inoculated with the same strain. However seedling reactions of CI12632 are unlike those of the other varieties. It is stated that the Wisconsin varieties have the Chinese factor for leaf-rust resistance, this factor being ineffective in the seedling stage against Australian strains. Timvera is resistant throughout life to these strains because it carries the same type of resistance as *T. timopheevi*. F_2 material of crosses involving Timvera showed a deficiency in plants resistant to strain 135BB of leaf rust; it is suggested that resistance is not inherited in a simple manner.

1422 Jain, A. C. & Pelletier, R.-L.
Effects of rust infection on the carbohydrate metabolism of wheat seedlings.
Nature, Lond. 1958 : **182** : 882–83.

In studies of the distribution of C^{14} from photosynthetically fixed $C^{14}O_2$ among the sugars in the stem-rust resistant wheat Gabo 54 and the susceptible variety Little Club, it was found that, compared with uninfected material of both varieties and with inoculated Gabo 54, inoculated Little Club showed a very marked accumulation of C^{14} in sedoheptulose and a slight increase in relative radioactivity of other sugars. Sucrose was an exception, its radioactivity being decreased.

1423 WILCOXSON, R. D.
Peduncle sclerenchyma tissue of Nugget wheat in relation to development of pustules of *Puccinia graminis* var. *tritici*.
Phytopathology 1958 : **48** : 518–19.

In the 15B susceptible variety Nugget, the sclerenchyma of inoculated plants tears readily as the fungus develops and that of uninfected plants contains numerous intercellular spaces. Similar intercellular spaces are found in other *Triticum aestivum* varieties in which the fungus develops rapidly, but few or none occur in varieties on which it develops slowly. *T. durum* varieties all had intercellular spaces however. Nugget was the only wheat among four *T. aestivum* and four *T. durum* varieties to show consistently abundant spaces when grown in different localities.

1424 MORALES, I. N.
Studies on Septoria leaf blotch of wheat.
Diss. Abstr. 1958 : **18** : Publ. No. 24,167 : 357–58. (Abst.).

Investigations at Purdue University showed that liquid shake-culture is the most effective method of producing large quantities of inoculum of *Septoria tritici* for testing the resistance of wheats. Highly virulent inocula were produced in Fries and malt-extract media; almost complete avirulence resulted from growth in a nutrient dextrose medium. Moist chamber incubation at 60–70° F. produced more satisfactory infection than incubation at 80° F. Standardized inoculation techniques and a rating scale of resistance were devised.

Of 640 winter wheat varieties artificially inoculated in the field, 42 were classified as very resistant and 98 as resistant. Earliness was associated with susceptibility and lateness with resistance. A group of 237 spring wheats were classified for disease resistance under conditions of natural infection. Seven varieties were very resistant and 20 were resistant. These reactions were in close correlation with reactions observed in the greenhouse after artificial inoculation.

In crosses of the resistant winter wheat Nabob with the susceptible varieties Knox and Vermillion, resistance seemed to be governed by two independent genes lacking dominance but with additive effects. Awnedness, coleoptile colour and resistance to leaf blotch were independently inherited in the cross Vermillion x Nabob. In crosses between the resistant variety Lerma 50 and the susceptible wheats, Lee and Mayo 54, resistance was governed by a single dominant gene; the inheritance of dominance was similar in a cross between the resistant P_{14} and Lee. Cultures of *S. tritici* from four states showed no specialization in pathogenicity, when tested on 16 varieties of varying susceptibility.

1425 ALLAN, R. E.
Genetic analysis of ten sources for Hessian fly resistance, their interrelationships and association with leaf rust resistance.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1260 : 1193–94. (Abst.).

In a study at Kansas State College, sel. 52400 (Chiefkan - Hard Federation - Kawvale x PI119344–7) carried a partially dominant factor, derived from PI119344–7, for resistance to western and eastern strains of Hessian fly in the USA. Pawnee may possess two recessive factors for resistance to western Hessian fly. This variety contained a partially dominant factor for resistance to races 9 and 11 of leaf rust. A partially dominant factor for resistance to races 5, 9 and 15, presumably derived from Hard Federation, was present in sel. 52400. It was linked with the gene for Hessian-fly resistance. According to data from Pawnee x sel. 52400, the latter wheat also contained a factor for resistance to leaf rust (race 9) which suppressed the resistance associated with the Pawnee factor, as well as a partially dominant gene for resistance (chromosome XIV). In an investigation of material being used as sources of resistance to Hessian fly in breeding in Kansas, sel. 52382 (Pawnee x PI94547–1) and a number of other selections of various origins were found to contain the "same factor or an allele of the H_3, Illinois No. 1 factor." The data further suggested that these selections also had h_4. "Apparently the H_3 and h_4 factor described in California are the same, alleles or pseudoalleles as studied with midwestern hessian flies." Sel. 52357 (Pawnee x Ribeiro) carried H_5, derived from the latter parent. In addition, this selection seemed to have obtained a minor factor or factors for resistance from Pawnee. CI12855 (Pawnee x *Triticum durum* 'PI94587') contained a partially dominant gene (Hf_6), different from those heretofore reported for resistance to Hessian fly. A recessive factor for resistance to race 15 of leaf rust in CI12855 was inherited independently of Hf_6. The resistance to western Hessian fly shown by Ponca behaved recessively and appeared to be under control of one major and two minor genes.

1426 Daniels, N. E. & Porter, K. B.
Greenbug resistance studies in winter wheat.
J. econ. Ent. 1958 : **51** : 702–04.

Details are given of a method of screening hybrids for resistance to *Toxoptera graminum* under controlled environmental conditions. Out of 1026 F_2 plants derived from crosses of the resistant variety Dickinson with five susceptible commercial wheats, 28 showed considerable resistance. F_3 families from the resistant individuals and 190 unselected F_3 families were screened. The high percentage of resistant F_3 families obtained from the resistant F_2 plants indicated that progress had been made in selecting for resistance. It appeared that reaction to the pest was controlled by a single pair of genes, with susceptibility dominant. Modifiers may also have been involved.

1427 Ivanov, I.
(Experiments on soaking the seed of the wheat varieties 14, Karnobat 92 and 0109 in water before sowing).
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-Industr.) : 1958 : **3** : No. 2 : 25–28. [Bulgarian].

The effects of soaking the seeds of the above varieties upon their yields were studied at Poljanovgrad, varietal differences being noted.

1428 Schmalz, H.
Die generative Entwicklung von Winterweizensorten mit unterschiedlicher Winterfestigkeit bei Frühjahrsaussaat nach Vernalisation mit Temperaturen unter- und oberhalb des Gefrierpunktes.
(The generative development of winter wheat varieties with different winter hardiness in spring sowing after vernalization with temperatures below and above freezing point).
Züchter 1958 : **28** : 193–203.

Fifty-two wheats including winter-hardy, moderately winter-hardy and susceptible varieties were treated in the following ways before being sown in the open at Hohenthurm: (*a*) pregermination without vernalization; (*b*) vernalization at about 1° C.; (*c*) vernalization at — 3° C. and (*d*) a daily alternation of (*b*) and (*c*). At the beginning of September, plants from every variety in each treatment were classified into five groups according to their stage of development and an average value for the degree of development was calculated. The results are shown graphically.

Within each group of varieties differences were found in the vernalization requirement as shown by the length of vernalization period required at a certain temperature to induce full development. In general the susceptible varieties had low vernalization requirements, an exception being Heines III. Amongst the winter-hardy wheats, varieties with particularly high and others with low vernalization requirements were found. Variation amongst the moderately hardy varieties was not so great in this respect. The results did not confirm the views of other workers that the hardy varieties are more easily vernalized by low temperatures than the less hardy varieties. For all varieties the optimum temperature for vernalization was just above freezing point. The lower temperature limit for vernalization was — 3·5° C.

1429 Šulyndin, A. F. & Poltarev, E. M.
(The difference in passing the vernalization phase by the seed and green plants of interspecific hybrids of wheat).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 4 : 14–17. [Russian].

Hybrids of *Triticum vulgare* x *T. durum* were (1) sown with vernalized seed in the spring and then studied under laboratory conditions and (2) sown with untreated seed outdoors in the autumn. The soft wheat segregates of F_6 (Odessa 3 x Melanopus 69) and F_5 (Alabasskaja x Narodnaja [People's]) under the first treatment had a vernalization period approximating to that of soft wheat. In the second treatment the plants showed a great variability in respect of vernalization period, this being generally shorter than that of a soft winter wheat variety. Similar but more marked distinctions were observed in the hard wheat segregates of F_6 (Alabasskaja x Narodnaja) and F_6 (Alabasskaja x Melanopus 69).

In the second treatment, some plants had as short a vernalization period as semiwinter wheats, e.g. Arandany. It is concluded that the prognosis of winter hardiness should be based on observations of vernalization under field conditions.

1430 Riley, R., Unrau, J. & Chapman, V.
Evidence on the origin of the B genome of wheat.
J. Hered. 1958 : **49** : 91–98.

Since both pairs of satellited chromosomes of the polyploid wheats are known to be in the B genome, it seemed likely that the donor of the B genome is a diploid species with two pairs of satellited chromosomes resembling those of the polyploid wheat. Accordingly studies were made of the caryotypes of a number of diploid species which have been considered as possible donors of the B genome; only the satellited chromosomes of *Aegilops speltoides* showed a close resemblance to those of the tetraploid wheats.

Studies of chromosome pairing in hybrids also supported the view that *Ae. speltoides* contributed the B genome. A fairly high level of pairing was found in triploids involving *Ae. speltoides* and tetraploid wheats. However considerable trivalent formation indicated that the genome of *Ae. speltoides*, unlike that of other *Sitopsis* species, is partially homologous with both the A and B genomes. Frequent multivalent associations occurred in crosses between *Ae. speltoides* and tetraploid wheats. It is suggested that *Ae. speltoides* contains an allele or alleles dominant to and reversing the effect of those which are thought to restrict pairing to completely homologous chromosomes; these latter genes occur on chromosome V of the B genome. Pairing data in other intergeneric hybrids have also been interpreted with reference to a mechanism restricting intergenomic pairing. The geographical distribution of *Ae. speltoides* and the *Triticum* species does not conflict with the hypothesis that *Ae. speltoides* is the donor of the B genome.

The genome of *T. timopheevi* is mentioned as behaving like that of AB tetraploids in hybrids with *Ae. speltoides*. Also this species has similar satellited chromosomes, presumably in the G genome. AG tetraploids may therefore have had a similar origin to that of AB tetraploids.

It is thought that, since common wheat already has two *Aegilops* genomes, the use of this genus as a source of variation for wheat improvement should be encouraged.

1431 Tanaka, M.
Morphological characters of nine diploid analysers of the genus *Aegilops*.
Wheat Inform. Serv. Kyoto 1958 : No. 7 : 22–23.

Tabulated information is provided on the genome and ear and spikelet characters of nine species of *Aegilops*.

OATS

1432 Oliveira, A. J. de
Analysis of a group of experiments on oats. I. Complete data.
Agron. lusit. 1957 : **19** : 329–56.

The data analysed in this paper are 24 oat trials carried out in Iowa during 1950–4. These trials were not uniform in respect of design, number of replications, constancy of treatment, orthogonality or experimental error. A method of estimating average response and its reliability based on analysis of variance of the unweighted mean is described and illustrated. Optimum numbers of replications, places and years for fixed cost and number of varieties are worked out.

1433 Murphy, H. C.
Registration of oat varieties, XXI.
Agron. J. 1958 : **50** : 701–07.

Recently registered by the US Department of Agriculture in cooperation with the American Society of Agronomy, the following varieties are described: Indio, Palestine, Burnett, Centore, Crater, Minhafer, Minland, Ransom, Winema, Bentland, Clintland, Dubois, Mid-South, Newton, Putnam, Suregrain, Dupree, James, Waubay, Arkwin, Ferguson, Jackson, Park and Bonham. The varieties have nearly all been released during the last decade and, with the exception of Palestine, Winema and Park, have already been referred to in *Plant Breeding Abstracts*. Palestine, an introduced variety distributed in 1940, is particularly well adapted in the mild-winter areas of the arid south-west. It is very early in maturity, with short straw, relatively low test weight, red kernels, high hull percentage and considerable resistance to shattering. Winema (Magistral x Richland), a yellow oat developed cooperatively by the Iowa and Oregon Agricultural Experiment Stations and distributed in 1954 to farmers in the Klamath Basin, Ore., is suitable as a companion crop and for late sowing or for growing in short-season areas. It has short stiff straw, resistance to shattering and sufficient resistance to crown and stem rust to permit the necessary irrigation for good stands of clover and lucerne but is rather low in test weight. Park (Clinton x Overland^2), a white oat bred at the Branch Experiment Station, Aberdeen, Idaho, and released in Montana in 1953 and in Idaho in 1958, has the gene *A* for resistance to races 1, 2, 3, 5, 7 and 7A of stem rust, together with the Victoria type of resistance to most races of crown rust. On account of its short and very stiff straw, Park is especially suitable for direct combining.

1434 Morey, D. D.
Radar oats. Two dual-purpose varieties for South Georgia.
Mimeogr. Ser. Ga. cst. Pl. Exp. Sta. 1958 : No. N.S. 60 : Pp. 6. (Mimeographed).

Radar 1 and Radar 2, both developed from

Coker's Victorgrain 48–93 x (Bond-Rainbow x Hajira-Joanette) x Landhafer, are early-maturing, disease-resistant oats giving good yields of green forage and grain in the Coastal Plain area of Georgia. They are resistant to most races of crown rust and to races 6, 7, 7A and 8 of stem rust. Resistant to the Fulghum and Victoria races of loose smut, they are somewhat susceptible to the Fulgrain 3 race. Both varieties are highly resistant to Victoria blight and have been outstanding as regards straw strength. Radar 1 grows slightly shorter than Radar 2. Radar 1, producing slightly more grain and less forage than Radar 2, has smaller kernels which are a uniform golden yellow. Radar 2 has kernels ranging from light yellow to white.

1435 Nuove razze di avena. (**New oat varieties**).
Sementi elette 1958 : **4** : No. 3 : 61–62.

Two varieties produced at the University of Pisa are described. Argentina is early and very resistant to lodging and has yielded 35–40 c. per ha.; it can be grown under a wide range of conditions in Italy.

Castellaneta is also early and resistant to lodging; it has yielded up to 35 c. per ha. of grain.

1436 Koo, F. K. S.
Pseudo-isochromosomes produced in *Avena strigosa* Schreb. by ionizing radiations.
Cytologia, Tokyo 1958 : **23** : 109–11.

The behaviour of pseudo-isochromosomes found at meiosis in plants of *A. strigosa* 'Saia' raised from seed treated with X rays or thermal neutrons is described.

1437 Rohrlich, M. & Brückner, G.
Untersuchungen an deutschen Hafersorten. (**Investigations on German oat varieties**).
Z. Pflanzenz. 1958 : **40** : 266–74.

The results are reported of investigations on the technological properties of a large number of German varieties and strains of oats. Tabulated information is provided on the hectolitre weight, 1000-grain weight, husk percentage and seed dimensions; the 1000-grain weight and husk percentage are also noted separately for the inner and outer seeds of the ear. Only a loose relationship was found between the hectolitre weight and the form of the seed. Where the hectolitre weight is extremely low, the seeds are longer, narrower and thinner than in cases where the hectolitre weight is particularly high. The 1000-grain weight, as determined free of water, is less influenced by the length of the seed than by its width and thickness; the higher the 1000-grain weight the more nearly circular is the cross section of the grain. The average 1000-grain weight of the inner grains was 27·7 g. and that of the outer grains 36·1 g. A low average 1000-grain weight may result from a relatively high proportion of inner grains or through the production of small grain; the size of the grain can be a varietal character. The white varieties showed 1000-grain weights superior to those of the yellow varieties.

Grain of low 1000-grain weight had more husk than heavier grain. White oat varieties produced rather less husk than yellow varieties, most husk being found in three black varieties. The black oats had husks with the lowest ash content; the husks of the white varieties had the highest ash contents.

Measurements were also made of the force required to split the lemma, the size of this force being found to be related to the thickness of the lemma.

The white varieties showed hulling capacities superior to those of the yellow varieties. In general a high husk percentage was accompanied by poor hulling capacity; the ash content of the husk did not appear to influence the hulling capacity but the ease with which the lemma could be torn off was of importance in this connexion.

Chemical analyses of the grain were also carried out; in general a negative correlation was found between the starch and crude protein contents. The black varieties had about 0·6% more crude fibre, 1·1% more crude fat and 1·1% less crude protein than the other varieties. Varieties differed considerably in their lipase values; a low fat content frequently occurred together with low lipase values, the reverse relationship being also found.

1438 Paunero, E.
Las Aveneas españolas. III. (**The Spanish Aveneae. III**).
An. Jard. bot. Madr. 1957 : **15** : 377–415.

The third part of this monograph presents a brief description of the genus *Avena*, with a key to the species, followed by descriptions of *A. pilosa*, *A. longiglumis*, *A. alba*, *A. fatua*, *A. sterilis*, *A. ludoviciana*, *A. sativa* and *A. byzantina*. Indications are given of the distribution of the respective species in the Iberian peninsula, evidence being presented for the first time of the occurrence of *A. pilosa* and *A. byzantina*. A reexamination of the original herbarium specimens of Lagasca has led to the conclusion that further detailed study of *A. alba* is necessary before an exact systematic position can be assigned to *A. hirtula*. *A. ludoviciana* is regarded as a hybrid of *A. sterilis*.

1439 Toms, J.
Oat varieties differ in susceptibility to manganese deficiency.
J. Agric. W. Aust. 1958 : **7** : p. 325.

Observations made of Avon and Dale in two seasons at Kendenup, WA, and one season at Bremer Bay, WA, on manganese-deficient soil have shown that Avon is less susceptible than Dale.

1440 Střída, J.
Zhodnocení jednotlivých československých odrůd ovsa z hlediska jejich vhodnosti do pícních směsek. **(An evaluation of some Czechoslovak oat varieties from the viewpoint of their suitability for forage mixtures).**
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 277–92.

Stupice, Dětenice and Chlumecký Žlutý [Yellow Chlumec] were the most productive varieties as components in mixtures with legumes among the oats tested at Troubsk, Brno province.

1441 Murphy, H. C., Petr, F. & Frey, K. J.
Lodging resistance studies in oats. I. Comparing methods of testing and sources for straw strength.
Agron. J. 1958 : **50** : 609–11.

At Aberdeen, Idaho, a large number of oat varieties were tested for lodging resistance; the lodging resistance factor cL_r [cf. XXV, 252] was determined and also the snap test was applied to each variety. In the snap test, "a handful of culms is pulled to a reclining position" and then allowed to snap back into place; the force required to pull the culms from an erect position and the rapidity with which the culms become erect again are recorded on a scale from one to ten. Both the snap measurement and the cL_r factor were found to be highly correlated with natural lodging but the snap measurement showed the closest correlation and the least seasonal interaction. Snap measurements are more rapidly made than determinations of the cL_r factor but accurate results are only obtained by skilled workers. Also a larger population of plants is required for the snap method than for the cL_r method.

The percentage of stem curvature also seemed to be related to straw strength but it is more dependent upon environmental conditions than snap and cL_r measurements. A lodging resistance index taking into account lodging percentage, curvature percentage, snap score and cL_r is proposed. Of the 50 varieties tested, five introductions from Scotland were most resistant.

1442 Murphy, H. C., Zillinsky, F. J., Simons, M. D. & Grindeland, R.
Inheritance of seed color and resistance to races of stem and crown rust in *Avena strigosa*.
Agron. J. 1958 : **50** : 539–41.

Reciprocal crosses between the varieties CD3820 and CI4748 of *A. strigosa* were studied. The grey-striped seed colour of CD3820 was dominant to the white colour of CI4748 and controlled by a single factor. Resistance to each of the races 6, 7, 7A and 8 of *Puccinia graminis* f. sp. *avenae* appeared to be determined by the same gene or genes; similarly the genes responsible for resistance to race 202 of *P. coronata* var. *avenae* also conferred resistance to race 258. At least two combinations of genes for resistance to stem and crown rust were present in the CD3820 plants. One of these genotypes possessed two independent dominant genes conditioning resistance to the four races of stem rust and three dominant genes responsible for resistance to the two races of crown rust. The other CD3820 genotype had an undetermined but different number of genes controlling resistance to stem rust and a single dominant gene for resistance to crown rust.

Both the parent varieties and the F_3 progeny showed resistance to the new and virulent race 276 of crown rust; it is therefore possible that the two parent varieties have the same gene or genes for resistance to this race.

1443 Romanko, R. R.
The nature of resistance of oats to Victoria blight.
Diss. Abstr. 1958 : **18** : Publ. No. 24,727 : 770–71. (Abst.).

Victorin was recovered from mixtures of toxin and plant extracts. "The results suggested that resistant plants were able to inactivate victorin by the possession of certain characteristics not found in susceptible plants. This inactivation may or may not have been enzymatic, but occurred only in intact tissue. Susceptibility was apparently due to the absence of the mechanism for inactivation which made possible the interaction of victorin and host protoplasm, one result of which was increased respiration. It was not established whether the increased respiration was pathological *per se*."

1444 Bingham, J. & Lupton, F. G. H.
Breeding spring oats for resistance to frit-fly attack.
Ann. appl. Biol. 1958 : **46** : 493–97.

Small-scale trials carried out since 1954 at the Plant Breeding Institute, Cambridge, England, have suggested that varietal differences in susceptibility to frit fly (*Oscinella frit*) at the tillering stage are mainly the result of preferences on the part of the pest when egg laying. In some cases, however, tolerance due to greater tillering capacity also played a role. No evidence was obtained of direct resistance. Tiller damage suffered by late-sown plots of Summer was clearly less than that observed in similar plots of other varieties. Hede, Spete and Lochow's Yellow approached Summer in apparent resistance at the tillering stage. It is noteworthy that all the four varieties are pure-line selections from land races found in countries where frit-fly attack is serious. Tests are to be carried out to ascertain whether the varietal disparities in susceptibility occurring in small plots are also shown on a field scale. Percentage of infection at the panicle stage appeared to be largely dependent on the stage of development of the plants at the time of egg laying, some varieties occasionally escaping attack by virtue of different rates of development or different sowing dates. In anticipation of the results of field-scale trials, breeding has been initiated in an attempt to develop a variety with improved resistance. The procedure to be used is outlined.

1445 Rademacher, V. B. & Schwarz, R.
Die Rotblättrigkeit oder Blattröte des Hafers—eine Viruskrankheit (*Hordeumvirus nanescens*). [**Red leafiness or leaf reddening of oats—a virus disease (*Hordeumvirus nanescens*)**].
Z. PflKrankh. 1958 : **65** : 641–57.

The above virus is shown to be identical with the barley yellow-dwarf virus. Varieties of oats studied in Germany have shown differences in their reactions to this virus. The early varieties and those with greatest tillering capacity are least susceptible.

RYE

1446 Winterrogge, 1958. (**Winter rye, 1958**).
Landbouwvoorlichting **15** : Bijl. 33; Ber. Rassenkeuze 1958 : No. 250 : unpaginated.

Among several new varieties included in tests on different soil types in the Netherlands, CIV IV has yielded rather more than Petkus. CIV 40 and Lochow's Kortstro [Lochow's Short Straw], tested for one year only, have also yielded well.

1447 Satarov, N. M.
(A new method of emasculating rye).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 3 : 63–64. [Russian].

A method giving a 100% emasculation, a grain set of 65–75% and facilitating the development of grains of normal size has been developed at the Maize Institute. It consists of pinching the rye spikelet midway along its length with forceps on the first or second day of earing. This damages the anthers, leaving the pistils intact.

1448 Nakajima, G.
(Cytogenetical studies on interspecific hybrids of rye. III. Results of crossing for 17 combinations; various external characters and PMC meiosis in the F_1).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 34–36 : 1171–82. [Japanese].

A morphological and cytological description is given of a series of F_1 interspecific hybrids involving *Secale africanum*, *S. cereale*, *S. fragile*, *S. kuprijanovii*, *S. montanum* and *S. vavilovii*. In general, the hybrids were heterotic in respect of culm length, spike length and number of spikelets per spike. The modal meiotic configuration was 7_{II} in all the combinations effected except *S. africanum* x *S. vavilovii* in which it was $6_{II} + 2_{I}$. Occasional multivalents were observed in most of the hybrids. On the basis of ease of crossability and meiotic behaviour, it is concluded that all the species have the same basic genome R which however exists in three variant forms: R, pertaining to *S. cereale* and *S. vavilovii*; R^a, *S. africanum*, *S. montanum* and *S. kuprijanovii*; and R^f, *S. fragile*. [Cf. XXVII, 2868.]

1449 Bose, S.
Aberrations in the nucleolar chromosome of inbred rye. III. Size variation in inbred lines in relation to vigour.
Hereditas, Lund 1958 : 44 : 257-79.

In further work on inbred lines of Stålråg [Steel rye] [XXVIII, 1601], nine more lines were classified according to the ratio of the length of the long arm of the nucleolar chromosome to the length of the short arm (minus the satellite). Four lines fell into a group (A) with ratios greater than 2·2. Another group (B) was represented by only one inbred, with a ratio of 2·1. The remaining lines formed a third group (C), with ratios of less than 2·0. As in the earlier investigations, variation in the ratio was chiefly due to differences in the length of the short arm. Preliminary data on vegetative and floral characters of the seven inbreds previously studied [cf. *loc. cit.*] suggested that chromosome type, as distinguished on the basis of the above ratio, length of short arm and size of satellite, bears some relationship with vigour. Lines with high ratio, small short arm and large satellite tended to be less vigorous than lines with a low ratio, large short arm and small satellite.

1450 LUNDQVIST, A.
Self-incompatibility in rye. IV. Factors related to self-seeding.
Hereditas, Lund 1958 : **44** : 193–256.

In 19 diploid families derived from a single plant by inbreeding, seed set upon selfing and frequency of self-seeding plants decreased with increasing amount of inbreeding. The frequency and degree of such pseudo-self-compatibility were clearly higher in het het genotypes for loci *S* and *Z* for incompatibility than the ho het group [cf. 325]. Within both the het het and ho het groups, pseudo-cross-compatibility in sib matings was higher in the pseudo-self-compatible category, on the ♀ side as well as the ♂. The different degrees of pseudo-self-compatibility, which were largely heritable, are attributed to the genes at *S* and *Z* and also to modifiers which may be active in both pollen and style. In diploid outbred populations, about 95% of the plants gave less than 5% set of selfed seed. Less than 1% produced a good set of selfed seed as judged by comparison with seed set from open pollination. When these populations were inbred, it was found that plants with a "high" set of selfed seed (above 10%) may occur in progenies derived from parents with a low set of selfed seed and *vice versa*. The decreased seed set of plants from parents with high set was in the majority of cases the outcome of inbreeding depression. Evidence is given for concluding that the occurrence of plants with high set of selfed seed in progenies of parents with low set upon selfing was mainly due to mutations at *S* and *Z*, which eliminated previous pollen specificities. No mutant allele appeared to reduce the functional capacity of the pollen carrying it or to impair the viability of the self-compatible plants. In tetraploid outbred populations, about 80–85% of the plants had less than 5% set of selfed seed, but no plants with a good set were obtained. Data on the inbred derivatives of the tetraploid populations showed a pronounced skewness towards low amount of selfed seed in the progenies in the case of practically all parental classes for set of selfed seed. Variation among the tetraploids in ability to produce selfed seed was largely heritable, but in comparison with the diploids this ability was more strongly affected by environmental factors. High set of selfed seed as the result of mutant pollen was extremely rare in the tetraploids, chiefly on account of the fact that single mutations will not be recovered in the diploid pollen unless two mutant alleles happen to occur in the same grain as the result of double reduction. The frequency of self-compatible diploid pollen is computed as about one-tenth of that estimated for haploid pollen (10^{-5}–10^{-7}). The persistence of self incompatibility in rye after chromosomal doubling is discussed in relation to species with a one-locus gametophytic system of incompatibility.

1451 GOFFART, H.
Anbauversuche mit "Heertvelder"-Roggen zur Bekämpfung der Stockkrankheit des Roggens. **(An experiment on growing Heertveld rye for the control of the rye stem disease).**
Z. PflKrankh. 1958 : **65** : 657–60.

In tests held in Westphalia, the Dutch variety Heertveld, a cross between Ottersum and Petkus, showed resistance to *Ditylenchus dipsaci* from three different sources. Heertveld outyielded Petkus on infested soils but not on soils free of eelworms.

1452 LÓPEZ C., U.
Obtención de centenos resistentes a la toxemia del pulgón de los cereales, *Schizaphis graminum* (Rond.). **(Production of ryes resistant to toxemia caused by the cereal aphid, *S. graminum* Rond.).**
Rev. Fac. Agron. La Plata 1957 : **33** : 183–93.

The early stages of breeding for resistance to the above aphid, leading finally to the development of the synthetic Insave FA [cf. XXVIII, 379], are described.

MAIZE

1453 PLATONOV, F. I.
(Ways of increasing maize yield in the Far East).
Kukuruza (Maize) 1958 : No. 3 : 23–26. [Russian].

Data showing grain and forage yields for a few early, midseason and late varieties tested at Habarovsk are presented. Worth mention among them is a midseason flint Zolotaja

[Golden], an introduction from China. It was more productive of grain than all the others, but its total yield of green matter was below that of late types such as Odessa 10 or VIR 42 [Institute of Plant Industry 42]. A reference is made to productive forage types bred recently at the Primor'e Research Station.

1454 Kočkin, I. F.
(The standard varieties for the Non-chernozem Belt).
Kukuruza (Maize) 1958 : No. 3 : 35–37. [Russian].

Sterling, Gruševskaja, Voronež 76 and Voronež 80 were the most productive forage types in the northern districts of the USSR among a large number of maize varieties, hybrids and populations tested by the State Varietal Commission.

1455 Nissen, Ø. & Skaland, N.
Forsøk med grønnfôrmais. **(Trials of maize for green fodder).**
Forskn. Fors. Landbr. 1958 : **9** : 315–29.

In trials held in Norway in 1948–52, Kingscrost KF, Pioneer 355 and Pioneer 389 were superior to the standard Wisconsin 240 in dry matter yield. In 1953–57, when Kingscrost KF was used as standard, Goudster [Golden Star] and some other Netherlands varieties equalled or slightly exceeded the standard in yield of dry matter.

1456 Lajter, D. S.
(An experiment on growing maize for grain in central Kazahstan).
Agrobiologija (Agrobiology) 1958 : No. 3 : 108–12. [Russian].

North Dakota and Voronež 76 were the most productive among varieties ripening grain under Karaganda conditions when grown on irrigated or rainfed ground.

1457 Mejoramiento del maíz. Tercera Reunión Centroamericana, Antigua, Guatemala, 9–15 de diciembre de 1956. **(Maize breeding. Third Central American Conference, Antigua, Guatemala, 9-15 December 1956)** : Pp. 178. (Mimeographed).

This report is divided into 11 sections, of which sections II, III, IV and X are of interest to plant breeders. In section II, P. Weatherwax, speaking on the origin of maize, criticizes the theory of Mangelsdorf and Reeves that pod corn is an ancestor of maize and suggests that maize, teosinte and *Tripsacum* all arose from a common ancestral line in Central America or Mexico [cf. XXV, p. 271]. Papers reported in sections III [pp. 19–51] and X [pp. 129–174] are summarized below. Section IV [pp. 53–73] contains reports and tables giving the results of varietal trials held in individual countries in Central America.

1458 *Fuentes O., A. Mejoramiento de maíz en Guatemala. (Maize breeding in Guatemala). (pp. 20–25).*

Work in Guatemala is concerned with developing varieties adapted to the three zones (1) hot, 0–1000 m. in altitude, (2) intermediate, 1000–1700 m. and (3) cool, 1700 m. and above. For zone (3), inbreeding and intervarietal hybridization of local varieties are being effected. In zone (2) the hybrids (47A x 7A) x 92A, 1483–45 x (187–2 x 317) and 92A x (187–2 x 317) have shown promise. The production of synthetics is also under way. Zone (1) is divided into the south-western, south-eastern, southern central and Atlantic regions, in each of which testing of various lines or varieties is in progress. In the southern central region, several hybrids involving either E855 or T97 in their parentage have done well.

1459 *Lewy Van Severen, M. Mejoramiento de maíz en El Salvador. (Maize breeding in El Salvador). (pp. 26–31).*

Work conducted since 1947 is outlined. Two synthetics obtained by crossing lines of Venezuela #3 and Empalizada [Stockaded] with Taverón have yielded 25% more than current varieties. The double-cross hybrid Salvadoreño H–1 [(ES–40 x ES–47) x (ES–43 x ES–45)] gives an average yield of 60 q./mz., has a maturation period of 90 days and is resistant to lodging and *Laphygma frugiperda*. A maize for ensilage has been obtained by crossing a simple hybrid between two lines with Amarillo Salvadoreño #1 [Yellow Salvadorean #1]. Collections of white and yellow varieties from North, Central and South America have been established at San Andrés and Santa Cruz Porrillo.

1460 *Escoto, E. Mejoramiento de maíz en Honduras. (Maize breeding in Honduras). (p. 32).*

The hybrids H–501 and H–503 have proved superior to introduced varieties in recent trials.

1461 *Salazar, A. [Salazar B., A.]. Mejoramiento de maíz en Nicaragua. (Maize breeding in Nicaragua). (pp. 33–37).*

Seed of the hybrids M–11, H–501 and H–503, the synthetic PD(MS)6 and the variety Venezuela 3, of which the first yields 62%, the next two 28–38% and last two 31% and up to 14% more than native varieties, is being distributed.

Attempts to improve the uniformity and yield of local varieties are in progress.

1462 *Salas, C. A. Mejoramiento de maíz en Costa Rica. (Maize breeding in Costa Rica). (pp. 33–39).*

Forty-five intervarietal crosses of yellow and 45 of white varieties have been effected and additions made to the collection of local varieties.

1463 *Arosemena, R. D. Mejoramiento de maíz en Panamá. (Maize breeding in Panama). (pp. 40–42).*

Work in Panama at present consists chiefly in testing varieties and hybrids.

1464 *Díaz, E. Mejoramiento de maíz en Colombia. (Maize breeding in Colombia). (pp. 43–44).*

Among 6202 lines under study at different stations, some 121 are of possible commercial value. In the hot zone with a mean temperature of 29 °C., three varieties are being developed: a yellow maize from intervarietal crosses; a white line derived from Rocol V–1; and a yellow line from a cross involving Venezuela 1 and Venezuela Pulla. Synthetic varieties are being developed at Palmira, Medellín and Bogotá.

1465 *Obregón, P. Mejoramiento de maíz en Venezuela. (Maize breeding in Venezuela). (pp. 45–46).*

Among recently developed maizes mentioned are the synthetic Sicarigua Mejorado [Improved Sicarigua], yielding 3000–3500 kg./ha. compared with 2500–3000 kg./ha. for Sicarigua, and some hybrids yielding 35% more than Sicarigua and Venezuela 1.

1466 *Rodríguez, A. Mejoramiento de maíz en el trópico de México. (Maize breeding in the tropics of Mexico). (pp. 47–49).*

At the new experimental field for the tropics established in 1955 at Cotaxtla, Veracruz, work has been concerned chiefly with testing lines, varieties and crosses and developing synthetics.

1467 *Poey, F. [Poey, F. R.] (Jun.). Trabajos de mejoramiento en una empresa privada, Semillas Corneli de Cuba, S.A. (Breeding work in a private firm, Corneli Seeds, Cuba, Ltd.). (pp. 50–51).*

The work reported here is described more fully below [1470].

1468 *Saldarriaga V., A. Resúmenes sobre control de las principales plagas del maíz en Colombia. (Summaries on the control of the chief pests of maize in Colombia). (pp. 139–43).*

In breeding for resistance to *Diatraea* species, two types of resistance are considered: (1) tolerance, i.e. ability to withstand the tendency to lodge when attacked; and (2) resistance, measured by the frequency of damage to stems and leaves, those plants which are free from larvae and show fewer than 1·5 leaf perforations per plant being regarded as resistant. So far, 12 resistant lines have been selected.

1469 *Salazar B., A. Resumen de los trabajos experimentales realizados con maíz en los últimos cinco años en Nicaragua. (Summary of experimental work on maize carried out in the last five years in Nicaragua). (pp. 144–34).*

Results of some trials are included and it is noted that resistance to *Helminthosporium turcicum*, *H. maydis* (*Cochliobolus heterostrophus*), *Puccinia polysora* and *P. sorghi* occurs in some of the tested material. The variety PD(MS)6 shows some resistance to mosaic.

1470 *Poey, F. R. (Jun.). Notas sobre Semillas Corneli de Cuba, S.A. y sus híbridos. (Notes on Corneli Seeds, Cuba, Ltd. and its hybrids). (pp. 160–74).*

The work of the above firm since its foundation in 1947 is outlined. Recently developed productive hybrids are: Corneli 54, with a vegetative period of 145 days, orange flint kernels with yellow tips, and well-covered ears yielding 82% of kernels; Corneli 100, ten days earlier than Corneli 54 and more resistant to weevil; Corneli 200, which has a tendency to form two ears, has short internodes and is similar to Corneli 54 in growth period and grain type; Corneli 300, which is ten days later than Corneli 54 and resembles Corneli 200 in plant type; Corneli 400, resembling Corneli 200 in growth period and plant type but having a slight purplish coloration; and Corneli 500, a semident variety which has long internodes and broad leaves, is resistant to *Helminthosporium* and ripens ten days later than Corneli 54.

The first generations developed from white grains found in yellow ears show a high proportion of lethal factors, in particular the factor for albinism. Nevertheless, 15 white lines free from lethal factors have been developed and have been used in single crosses.

An exposition is given of G. E. Smith's theory that hybrids with a long vegetative cycle and a long period of maximum nutritional requirements are best suited to clay soils which hold water and nutrients for a long time and release them slowly and that, correspondingly, medium-cycle hybrids do best on silts and short-cycle hybrids on sandy soils.

1471 GROGAN, C. O. & ZUBER, M. S.
A new method for labeling seed envelopes.
Agron. J. 1958 : **50** : 716–17.

A method adopted at the Missouri Agricultural Experiment Station for labelling seed envelopes in randomized yield trials of maize is described. The method is based on use of an addressing machine.

1472 THOMPSON, D. L.
Labeling seed envelopes using punch card equipment.
Agron. J. 1958 : **50** : p. 717.

The use of IBM punched card equipment at the North Carolina Agricultural Experiment Station to label seed envelopes in carrying out yield trials of maize is explained.

1473 CSETNEKI, A.
A martonvásári 5-ös és 39-es beltenyésztéses hybridkúkorica nemesítése. **(The breeding of the maize hybrids Martonvásár 5 and 39).**
Magyar Mezőgazdaság, Budapest 1958 : No. 2 : 8–9 [from Hungar. agric. Rev. 1958 : **7** : No. 3 : p. 1]. (Abst.).

The high-yielding, mid-early double-cross hybrid Mv5 and the lodging-resistant three-way hybrid Mv39 are described. The latter has a maturity period 4–5 days longer and yields about 10% more than the former and in addition produces abundant green matter rendering it suitable for ensilage.

1474 B., D.
(Scientific institutes dealing with agriculture in Hungary).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. 3 : 126–30. [Russian].

Mention is made of double-cross hybrids of maize bred at Martonvásár which have outyielded the best American hybrids in recent Hungarian trials.

1475 SCARPA, G.
Oltre 80 q.li di mais con il Marano Vicentino ibrido Maliani. **(Over 80 quintals of maize with Maliani's Hybrid Marano Vicentino).**
G. Agric. 1958 : **68** : p. 455.

The hybrid, a double cross from four inbreds selected from the local Italian maize Marano Vicentino, gave a yield equivalent to 81·29 c. per ha. in 1958 in the Veneto province, where it is thought promising on account of its flint grain, capable of producing flour of good culinary quality.

1476 Novità nel settore della maiscoltura italiana. **(Novelties in the field of Italian maize growing).**
Sementi elette 1958 : **4** : No. 2 : 66–67.

Two new double-cross hybrids shortly to be released in Italy are described. Asgrow 66 is a semiflint hybrid from crosses of dent x flint parents; with a maturity rating of 400, the hybrid is drought resistant and suitable for arid zones in central and southern Italy.
Asgrow 44 is a double-cross dent hybrid with a maturity rating of 800; it is resistant to lodging and can be grown with and without irrigation.

1477 STANEV, P. & GEORGIEV, T.
(The results of the introduction of hybrid maize in the Ruse district).
Kooper. Zemed (Cooper. Fmg.), Sofija 1958 : No. 3 : 16–17. [Bulgarian].

Recent substitution of the hybrid A26 x Dobrudža for local populations has resulted in an appreciable improvement in grain yield and a reduction of the growth period by 15 days.

1478 VĂLČINKOV, V.
(The results of intervarietal hybridization of maize).
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-Industr.) : 1958 : **3** : No. 3 : 21–38. [Bulgarian].

A15783 x Žălta Dobrudžanska [Yellow Dobrudža] and VIR42 [Institute of Plant Industry 42] x Čirpan 96 were the most productive among the hybrids bred and tested at Karvuna. In studies of heterosis it was found that no differences in the amount of heterosis occurred between intervarietal hybrids involving two or a greater number of varieties and that in either case heterosis could not be maintained.

1479 BONEV, E.
(Double-cross hybrids of maize in our country).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1958 : No. 2 : 18–19. [Bulgarian].

The production of inbred lines and the testing of their combining ability at various Bulgarian institutes is referred to briefly. Mention is made also of some top crosses bred in Bulgaria and the trials of some introduced material, especially some high-yielding American double crosses. Most of these, and also top crosses between Čirpan 96 and VIR 46 [Institute of Plant Industry 46] outyielded the Bulgarian standard, Žălta Dobrudžanska [Yellow Dobrudža] x A26.

1480 NEEMAN [NEMAN], S.
(Hybrid maize on small-holders' farms).
Sadah (Field)/Hassadeh 1958 : **38** : p. 545. [Hebrew].

Maize had not proved worthwhile on small holdings in Israel. The introduction of hybrid maize, however, may reverse this situation.

1481 ANISTRATENKO, D. G.
(Maize in the Primor'e).
Kukuruza (Maize) 1958 : No. **4** : 37–40. [Russian].

Gibrid Primorskij 5 [Littoral Hybrid 5] (Pioner Gorskij [Gorskij Pioneer] x Mestnaja Želtaja Kremnistaja [Local Yellow Flint]), Gibrid Primorskij 9 (Pioner Gorskij x Gruševskaja) and Gibrid Primorskij 18 (Mestnaja Belaja Kreminstaja [Local White Flint] x Voronež 76) were bred at the Primor'e Agricultural Research Station. All three ripen early and outyield Pioner Gorskij and other local varieties, Gibrid Primorskij 9, with a yield of 71 c. per ha., being the most productive.

1482 KÜHN, C.
Seed maize for the coming season.
Fmg. in S. Afr. 1958 : **34** : No. 6 : 16–17.

Information is given on the maize hybrids recommended for the Eastern and Western Transvaal and Northern and Eastern Free State.

1483 **New corn hybrid—1960.**
Sci. Fmr., Pa. 1958 : **6** : No. 1 : p. 13.

Pa555 has been released by the Pennsylvania Agricultural Experiment Station; it is in the midseason maturity range and suitable for central Pennsylvania. This new hybrid will replace Pa525; Pa555 and other Pa hybrids have outyielded OhM15 by about 70%.

1484 HUBER, L. L., GORSLINE, G. W. & KORMAN, G. W.
Pennsylvania corn performance studies 1957.
Progr. Rep. Pa. agric. Exp. Sta. 1958 : No. 192 : Pp. 12.

The results of tests of the performance of double hybrids and component inbreds in different localities in Pennsylvania during 1957 are summarized.

1485 **Georgia releases new corn hybrid.**
Crops & Soils 1958 : **11** : No. 1 : p. 21.

Georgia 206, developed at the College Experiment Station, Athens, Ga., is a high-yielding two-eared variety; it has performed well in the Piedmont area for several years. It is a full-season, yellow variety, which is more resistant to lodging than any other yellow maize recommended in Piedmont. The quality of the grain is good, the husk being fairly tight.

1486 CLAPP, A. L. & FINDLEY, W. R.
Kansas corn tests, 1957.
Bull. Kans. agric. Exp. Sta. 1958 : No. 397 : Pp. 29.

The results of trials of commercial and experimental hybrids in Kansas are reported and combined with data from previous years.

1487 SHANK, D. B. & KRATOCHVIL, D. E.
2 new corn hybrids.
S. Dak. Fm. Home Res. 1957 : **9** : No. 1 : 22–24.

South Dakota 420 was developed at the South Dakota Agricultural Experiment Station from the cross (WF9 x OH56A) x (OH45 x B8). It is slightly later than South Dakota 400, which it outyielded by an average of 8 bushels per acre over a four-year period in Minnehaha County. South Dakota 420 is also better than South Dakota 400 in respect of plant uniformity and root and stalk lodging resistance, although some stalk lodging occurs by midwinter. Husk protection is said to be fair and the resistance to corn borers is average. This new variety has been slightly attacked by rust and leaf spot and some smut has occurred in both ears and stalk. South Dakota 622, from the same experimental station, has the pedigree (WF9 x M14) x (OH41 x OH43). This variety is later than South Dakota 604 and may therefore be of value in the southern parts of South Dakota. In trials in Clay County, South Dakota 622 outyielded South Dakota 604 by 8 bushels per acre for 4 years. The ear shanks of this new variety are short and husk protection is good; the standing capacity is also particularly good. Only traces of rust, smut and leaf spot have been observed on South Dakota 622.

In producing both these new hybrids, the seed parent has to be planted several days before the pollen parent.

1488 KAVANAGH, L. R.
The sowing of hybrid maize. Which hybrid is best?
Agric. Gaz. NSW 1958 : **69** : 316–23.

Information is given on the performance of hybrids in different districts of New South Wales.

1489 ZINČENKO, T. JA.
(The results of two years of testing Soviet and American bred hybrids).
Kukuruza (Maize) 1958 : No. **3** : p. 38. [Russian].

The Soviet maize hybrids VIR 25 [Institute of

Plant Industry 25], VIR 42, VIR 281, Dnepr 2, Dnepr 31 and Dnepr 56 were more resistant to drought than the American hybrids King Cross, Warwick and Pioneer 382, 383 and 388 in comparative trials in the Ukrainian province of Nikolaev in 1956 and 1957. The Soviet hybrids yielded more grain and forage and were more resistant to smut and *Chloridea obsoleta.*

1490 Nuovi tipi di mais ibridi per colture di secondo raccolto. **(New types of hybrid maize for growing as a second crop).**
Sementi elette 1958 : **4** : No. 3 : 62–63.

Two hybrids, S1 and S2, are described as being early and short in stature; they are resistant to wind damage, corn borer, *Sesamia* and *Helminthosporium turcicum* and can be sown at the end of June after wheat. S1 is a dent corn and S2 is semiflint. The former is 180–190 cm. tall and the latter 170–180 cm.

1491 Kolesnikov, S. M.
(The question of the nature of heterosis in interline maize hybrids).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 3 : 15–19. [Russian].

A Mičurinist phylogenetic-ontogenetic hypothesis on the nature of heterosis in hybrids between inbreds is outlined. It is based on the two principles: (1) heterotic effects are generally produced by combination within one plant organism of contradictory elements from the parent forms, and (2) inbreds are endowed with phylogenetic possibilities from their distant past and these become activated and modified by an altered environment.

1492 Lonnquist, J. H. & Rumbaugh, M. D.
Relative importance of test sequence for general and specific combining ability in corn breeding.
Agron. J. 1958 : **50** : 541–44.

The results of the experiments described indicate the reliability of a system currently used in breeding maize, e.g. first screening new lines for general combining ability and then testing for specific combining ability among the selected groups. It was found that lines selected for specific combining ability represented a random sample in respect of general combining ability, when compared with an unselected group of lines from the same original source using a broad gene base tester.

In a series of 10 trials, significant differences with respect to yield were found between a synthetic variety made up of lines selected for specific combining ability and another synthetic originating from lines of the same parentage selected for general combining ability. The use of the tester providing a broad genetic base apparently resulted in the selection of lines having greater additive genetic effects and hence higher population yields than in the case where a tester of narrower genetic base was used.

There was a complete lack of correlation of the yields of 61 lines when crossed to a specific single-cross tester as compared with crosses to the parental tester providing a broad gene base.

1493 Mazoti, L. B.
Estudio sobre diferencias citoplasmáticas heredables entre *"Zea mays"* y *"Euchlaena mexicana"*. **(Study of heritable cytoplasmic differences between *Z. mays* and *E. mexicana*).**
Rev. argent. Agron. 1958 : **25** : 12–44.

Two strains of *Euchlaena*, A and B, similar in cytoplasmic constitution but differing in genotype, were developed by repeatedly back crossing the same original strain to two genotypically distinct maize pollen parents, one homozygous and recessive for several characters and the other homozygous and dominant. Reciprocal crosses between A and B then showed small but significant differences in degree of heterosis, indicating that genotype affects the heritable characters of the cytoplasm. In another experiment reciprocal crosses between two lines similar to A and B were compared with reciprocal crosses between the homozygous lines used in the back crosses; the hybrids thus produced were similar in genotype but different in cytoplasm. In this case reciprocal differences between the hybrids with *Euchlaena* cytoplasm were nonsignificant and between the hybrids with *Zea* cytoplasm slight; but compared with *Zea* cytoplasm, *Euchlaena* cytoplasm had a depressive effect upon yield. This persistence of the cytoplasmic effect of *Euchlaena* suggests that maize cytoplasm is not transmitted by the pollen. In further comparisons of *Zea* genotypes in *Zea* and *Euchlaena* cytoplasms, the lines with *Zea* cytoplasm were taller and produced fewer ears per plant. A selective effect of genotype was indicated by the greater survival of the types with *Zea* cytoplasm compared with those with *Euchlaena* cytoplasm. Action of the cytoplasm upon the genotype was demonstrated when the recessive genotype *plpl* in *Euchlaena* cytoplasm was found, after four back crosses to the dominant homozygote, in an appreciably higher proportion of the progeny than could be expected by chance, while the same gene in *Zea* cytoplasm, back crossed in the same manner, was absent from the progeny.

The cytoplasmic male sterility induced by the genes *ijij* persisted in crosses with the male parent *AA BB CC RR PrPr PlPl* but disappeared when the male parent used was of the genotype *Mrmr gg AA BB plpl rgrg*.

Pollination studies showed that in a mixture of equal volumes of *su* and *gl* pollen, the former type was more viable but the difference between the two was less marked on the female parent *glgl* than on *susu*. F_2 segregation for the gene pair *Glgl* was Mendelian on mother plants under dry conditions but deviated from the expected ratios when the water availability of the mother plant was high.

The effect of three years' selection of upper or basal grains of the ear in an open-pollinated variety was without effect upon yield. Treatment of pollen at 55° C. for five minutes did not exert a selective influence on either the *su* or the *Su* genotype. The alleles *R* and *r* showed no differential response to *Euchlaena* and *Zea* cytoplasm. Exposure to different doses of cosmic rays had no effect on the expression of the variegated character conditioned by *ijij*.

The paper includes a scheme for the classification of different types of variation and selective effects.

1494 Bell, W. D., Bogorad, L. & McIlrath, W. J.
Response of the yellow-stripe maize mutant (ys_1) to ferrous and ferric iron.
Bot. Gaz. 1958 : **120** : 36–39.

The leaf tissues of the above mutant, which is characterized by yellow stripes between the main vascular bundles, were able to metabolize ferric as well as ferrous iron. The abnormality of the mutant therefore appears to involve iron metabolism at a site other than the leaves.

1495 Peterson, P. A.
The effect of temperature on the mutation rate of a mutable locus in maize.
J. Hered. 1958 : **49** : 121–24.

[Cf. XXIII, 1157].

1496 Popow, G.
Orla 266, ein Hybridmais für den Anbau in der Schweiz. **(Orla 266, a hybrid maize for cultivation in Switzerland).**
Mitt. schweiz. Landw. 1958 : **6** : 104–07.

The results are reported of trials of Orla 266 and other varieties as grain and silage crops in Switzerland. Information on the characteristics of this variety has already been summarized [XXVII, 1709].

1497 Roberts, L. M. *et al.*
Razas de maíz en Colombia. **(Races of maize in Colombia).**
Bol. téc. DIA, Bogotá 1957 : No. 2 : Pp. 159.

Maize collections made in Colombia comprised 1999 samples which, on the basis of vegetative characters, features of the tassel and ear and physiological, genetical, and cytological characters, were classified into 23 races. The latter fall into the following three categories: (1) primitive races, comprising the two Colombian races Pollo [Chicken] and Pira, which have the small ears and grains, the tendency to branch and the high frequency of a gene conferring sterility in crosses characteristic of pop corn; (2) nine races which have probably been introduced and appear to have no progenitors in Colombia; and (3) hybrid races whose parentage includes Colombian races [cf. XXIII, 1158]. Of the 12 races constituting the last group, some are widely distributed and are believed to be of prehistoric origin while others, limited in distribution, appear to have originated more recently. Descriptions, illustrations and tabulated data are given for each race. The four main factors contributing to the development of the Colombian races are: (1) geographical isolation; (2) interracial hybridization; (3) hybridization with Mexican maize lines showing teosinte introgression; and (4) hybridization with *Tripsacum*. The material collected has yielded lines of value for breeding. The race Chococeño, for example, adapted to regions with 10 m. annual rainfall, is expected to be of use in breeding for resistance to excessive humidity, and several races have proved resistant to *Helminthosporium turcicum*. In addition, Colombian races have a high frequency of genes governing the restoration of fertility to lines with cytoplasmic male sterility.

1498 Wellhausen, E. J., Fuentes O., A., Hernández Corzo, A. & Mangelsdorf, P. C.
Razas de maíz en la América Central. **(Races of maize in Central America).**
Foll. téc. Secretaría Agric. Ganad., Méx. 1958 : No. 31 : Pp. 138.

On the basis of the same characters used in earlier work [cf. XXIII, 1158 and XXIX, 1497], 1054 collections from Guatemala were found to include 13 distinct races and nine subraces. The same evolutionary factors have influenced the development of races in Guatemala as in Mexico [cf. XXIII, 1158], and in addition, the high proportion of Indians in the Guatemalan population has aided in the preservation of certain distinct maize races. The most primitive race is the Mexican Nal-Tel, which seems to have been the original maize of Guatemala and which comprises five subraces. Imbricado [Imbricate] shows a complex of characters found in the primitive Mexican pop corn Palomero Toluqueño. Among 11 other Guatemalan races and their subraces, some appear to have changed little since their introduction from South America some time after the introduction of Nal-Tel, and others appear to be derivatives of hybrids of the introduced varieties *inter se*, with established races and with teosinte. Cytological studies show that a high number of chromosome knobs occurs in races from low altitudes and a low number in those from high.

A preliminary survey of the 177 collections made in El Salvador, Honduras, Costa Rica, Nicaragua and Panama indicates that there is less diversity of maize in all these countries combined than in Guatemala. However, at least two races not collected in Guatemala occur in these countries and the influence of several others in mixed races is recognized.

The evidence suggests that the countries of Central America, especially Guatemala, have had cultural contacts with those of South America in prehistoric times, and the fact that exotic races are most common in western parts of Guatemala, and in western Mexico, is in agreement with the view that these contacts may have been by sea.

1499 MANGELSDORF, P. C.
Ancestor of corn.
Science 1958 : **128** : 1313–20.

MANGELSDORF, P. C.
Reconstructing the ancestor of corn.
Proc. Amer. phil. Soc. 1958 : **102** : 454–63.

The author describes a reconstruction of the ancestral form of maize, based partly on fossil and archeological remains and partly on the genetic recombination of some of the primitive characteristics still existing in present-day varieties.

The fossil evidence comprises pollen grains found in a drill core taken below Mexico City, as reported by Barghoorn *et al.* The pollen, which was scarcely distinguishable in size, shape and other features from that of modern maize, was assigned to the last interglacial period and was therefore probably at least 80,000 years old. This discovery is regarded as evidence that the ancestor of maize was maize and not teosinte or *Tripsacum*. From an examination of one of the Bat Cave cob specimens from New Mexico, which are the oldest known remains of cultivated maize, the author and W. C. Galinat concluded that maize from this site combined the characteristics of both popcorn and pod corn. The results of crossing popcorns from different parts of the world with pod corn were therefore determined.

Crossing with popcorn has in general tended to reduce the effects of the single gene known to control the pod-corn type. Two varieties, Lady Finger and Argentine, carry complexes of modifiers, and a third variety, Baby Golden, a major modifier, which appreciably reduce the expression of this gene. True-breeding pod-popcorns have been developed which are completely fertile and might under suitable conditions be capable of surviving as wild plants. When grown on fertile soils, they produce several stalks. The plants are shorter than ordinary maize, because the pod-corn gene has the effect of shortening and thickening the upper internodes. The reduction in height is concomitant with the development of terminal inflorescences bearing both ♂ and ♀ flowers, at the tips and bases of the same tassel branches respectively. When the seeds are ripe, the tassel branches are brittle and break easily when disturbed by wind or birds, a mode of seed dispersal thus being provided. A number of characteristics of the ears, if produced, depend on position on the stalk. The higher the ear, the smaller its size, the more likely are both ♂ and ♀ flowers to be found, the shorter the shank, and the more likely are the leaf blades terminating the outer husks to be short or absent. With a shorter shank, fewer husks are developed since the joints from which they arise are reduced in number. An ear borne immediately below the terminal inflorescence is enclosed while the seeds are developing but as these mature the husks spread apart, allowing seed dispersal. The most primitive ear so far obtained among the pod-popcorns is much closer in kernel weight and number to the type represented by a prehistoric cob from the La Perra Cave in Mexico than to the ear of modern dent. The possession of ears with both ♂ and ♀ flowers by the pod-popcorns prompted reexamination of prehistoric cobs in this connexion. Some were found to have stumps, previously unnoticed, of a slender stem on which it is considered ♂ flowers were borne. The occurrence of bisexual ears in the synthesized primitive types also throws light on the significance of ears with terminal ♂ spikes in some Latin-American races. In this characteristic the ears of the pod-popcorns resemble the lateral inflorescences of *Tripsacum*, and on this and other grounds the synthesized strains could be easily classified as an annual representative of this genus.

It is suggested that the capacity of wild maize to respond to freedom from weed competition and to more fertile soil conditions by producing several stalks and one or more ears led to its highly successful domestication. Mutation of the pod-corn gene is regarded as the most important genetical change in the evolution of the crop, since it resulted in reduction in glume size and the concomitant development of a larger cob, and in separation of the sexes and production of a larger ear of the grain-bearing type no longer capable of seed dispersal. Subsequently, human selection for large ears has tended to eliminate secondary stalks and reduce ear number. In addition to mutation and human selection, extensive interracial hybridization and repeated hybridization with teosinte and perhaps also with *Tripsacum* are believed to have played a role in the evolution of the crop.

1500 NATARAJAN, A. T. & SWAMINATHAN, M. S.

An abnormal nucleolar condition induced in maize by radioactive phosphorus treatment.

Naturwissenschaften 1958 : **45** : 494–95.

At the Indian Agricultural Research Institute, New Delhi, dry seeds of the variety 6453–54 were treated with P^{32} at dosage rates of 20 μc and 50 μc per seed for 72 hr.; plants from the latter treatment were completely sterile but microsporogenesis could be studied in those which had received the lower dosage. Many abnormalities, such as asynapsis and the formation of polyvalents, were observed during the first division of meiosis. Usually one bivalent was attached to the nucleolus; in some cases, a trivalent or tetravalent was also attached. In one cell, three univalents and one bivalent were attached to the nucleolus. In cells containing more than one nucleolus, the number varied from 1 to 19; these sometimes persisted until metaphase. An unequal number of nucleoli at each pole was found in some interphase cells; others had an equal number. It is suggested that the numerous nucleoli may have arisen by budding caused by deletion or inactivation of the nucleolar organizer or a disturbed DNA metabolism. It is not known why there was no visible chromatin in the treated cells.

1501 BRINK, R. A.

A stable somatic mutation to colorless from variegated pericarp in maize.

Genetics 1958 : **43** : 435–47.

A colourless mutant allele designated P^{ww}_{m-1} was first discovered in a patch of 43 colourless kernels in an ear of a medium-variegated pericarp type bearing 320 seeds, the plant concerned being heterozygous for colourless pericarp and red cob (P^{vv} P^{wr}). The P^{ww}_{m-1} allele appears to have arisen as a somatic mutation of the unstable P^{vv}; colourless pericarp and cob is one of the least frequent mutant phenotypes among the offspring of plants carrying P^{vv}. This mutant allele P^{ww}_{m-1} is transmitted normally through male and female gametophytes; homozygous plants show normal vigour and there is no evidence that P^{ww}_{m-1} has an adverse effect on development as would be expected if it represented a deficiency at the *P* locus. It is a stable mutant; examination of 4536 plants carrying P^{ww}_{m-1} revealed only one with a coloured ear whose pattern of stripes was not like that of any typical form of variegated pericarp.

Evidence is presented indicating that modulator *Mp* is part of the P^{ww}_{m-1} allele. In some ways the modulator components of P^{ww}_{m-1} and P^{vv} are similar. Both suppress the pigment-producing action of P^{rr} and both are responsible for the same pattern of *Ds* chromosome breakage. Also in $P^{ww}_{m-1}P^{vv}$ heterozygotes, P^{ww}_{m-1} is said to "markedly depress the frequency of somatic mutation of the P^{vv} homologue to P^{rr}, just as P^{vv} has been observed to do reciprocally, in $P^{vv}P^{vv}$ homozygotes." [Cf. XXVII, 1725]. The difference between P^{ww}_{m-1} and P^{vv} is thought to lie in the strength of bonding of *Mp* to the *P* locus; the stability in position of *Mp* in P^{ww}_{m-1} results in the latter's resemblance to the stable allele P^{ww}.

The part which factors of the modulator type play in chromosome organization is discussed.

1502 SCHWARTZ, D.

A new temperature-sensitive allele at the sticky locus in maize.

J. Hered. 1958 : **49** : 149–52.

When homozygous, the mutant gene st^e causes chromosome stickiness at anaphase I and also a high degree of chromosome breakage in the endosperm, this breakage being responsible for variegation for endosperm markers through loss, regardless of the chromosome on which they are situated. The variegation is expressed only when the markers are present in the heterozygous condition. The point of initial breakage is nonspecific and may occur anywhere along the chromosome. Breakage is not limited to the chromosomes introduced into a cross by the st^e st^e ♀ parent. The gene, which is allelic to *st* (chromosome 4) is temperature-sensitive, giving a completely normal phenotype at low temperatures (65–70° F.) and showing mutant behaviour only at higher temperatures.

1503 Ting, Y. C.
On the origin of abnormal chromosome 10 in maize (*Zea mays* L.).
Chromosoma 1958 : **9** : 286–91.

An abnormal chromosome 10 carrying an extra chromosome segment was noted in microsporocytes of a plant originating from a cross involving a Peruvian variety and a USA inbred strain; the plant lacked the B chromosome but was heterozygous for the abnormal chromosome 10. The extra piece of chromatin on this chromosome resembled closely the terminal part of chromosome B. It is thought possible that a portion of the B chromosome including the terminal spindle fibre attachment had broken off and then became attached to the end of the long arm of chromosome 10 in a previous division, a simple translocation between a B and an A chromosome having thus taken place. The acentric portion of the B chromosome was not found.

In the same plant, chromosome configurations were noted which differed from any found in microsporocytes homozygous for the normal chromosome 10. At metaphase I secondary centric regions, varying in number from one to four on a single bivalent, were observed on several bivalents in many sporocytes; fibre-like structures coming from the secondary centric regions were also apparent. During anaphase univalents with one or more secondary centric regions reached the poles before those without secondary centric regions; in metaphase II, these regions showed precocious movement towards the poles, whilst the primary centric regions were orientated on the equatorial plane. It is stated that "the manifestation of the secondary centric regions may be related to the spindle attachment point located at the terminal region of the B-chromosome, and this spindle attachment point was often not apparent in the abnormal chromosome 10." In studying some additional plants of the same cross, an abnormal chromosome 9 was noted; this chromosome had a large piece of heterochromatin, resembling the bulging pycnotic region of the regular B-chromosome, attached to the distal end of the short arm. This abnormal chromosome may also have originated by a translocation; the portion of the B chromosome bearing the spindle attachment region was not found.

1504 Bodea, C. & Nicoara, E.
Asupra conţinutului în vitamine al diferitelor soiuri de porumb şi a modifiării lui în urma hibridizării. **(On the vitamin content of different varieties of maize and its modification following hybridization).**
Stud. Cercet. Agron., Cluj. 1957 : **8** : 195–201.

The control of provitamin A, aneurin, niacin and vitamin E was determined for 13 Rumanian varieties and for some F_1 and F_2 intervarietal hybrids. The highest content of provitamin A was in the varieties Portocaliu [Orange], Scorumnic, Arieşan [maize from Arieş] and ICAR 54. There was a tendency for a high content in provitamin A to be associated with a high content of the other vitamins. The content of vitamins A and E tended to be lower in the F_1 hybrids than in either of the parents.

1505 Vysokos, G.
(Maize in Siberia).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1958 : No. 5 : 41–43. [Russian].

New forage varieties bred at Omsk and Slavgorod are mentioned for their short growth period which enables them to ripen grain under Siberian conditions. The yield of forage and grain has been further improved by crossing new varieties with southern dent ecotypes.

1506 Astrelin, M. M.
(An experiment on producing supplementary pollen).
Kukuruza (Maize) 1958 : No. **3** : p. 37. [Russian].

By sowing 10 m. wide strips 9 days later than the rest of a maize field on a farm in Stavropol', more pollen became available for open pollination at the peak of flowering and resulted in improvements of grain and forage yields.

1507 Ščedrina, R. N.
(Changes in the pollen of maize plants resulting from different methods of pollination).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 240–45. [Russian].

The following effects of different kinds of pollination upon the pollen of the F_1 were observed at the Genetics Institute of the USSR Academy of Sciences. (1) The depressing effects of self pollination and restricted pollination were apparent in a reduction in pollen size and a slowing down of metabolic processes. (2) These effects were almost completely nullified by the addition of a small amount of pollen of another variety. (3) Supplementary pollination with a large amount of self pollen, the pollen of another variety or a pollen mixture resulted in an increase in the size of the pollen grains and intensified metabolic activity.

1508 POLUMISKOVA, M. V.
(Improvement of the varietal properties of maize seed in connexion with pollination conditions).
Agrobiologija (Agrobiology) 1958 : No. 3 : 119–23. [Russian].

Experiments on supplementary pollination of Sterling by mixed pollen of plants of the same variety grown in another field at the Kirgiz Agricultural Institute are described. Data on 1000-grain weights and grain yields of the F_0, F_1 and F_2 are presented. The best results were obtained when the ripe stigmas were pollinated with pollen gathered in the morning. The resultant seed gave rise to more productive progeny than the open pollinated controls and showed improved resistance to smut.

1509 MEDVEDEVA, G. B. & EJDUS, L. H.
(The use of labelled atoms in the study of the fertilization process in plants).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **118** : 1037–39. [Russian].

A maize variety with white grain was fertilized by radioactive pollen of a yellow-grained variety and the amount of radioactivity was determined in the resultant yellow, white and whitish-yellow grains on the F_0 at the Institute of Genetics at the USSR Academy of Sciences. It was found that yellow grains were the most and the white the least radioactive with the whitish-yellow in between the two. It is concluded that a large amount of pollen-tube contents reaching the embryo sac promotes the dominance of characters of the pollen parent, in this instance yellow grain colour.

1510 EVERETT, H. L., UMALI, D. L. & SANTOS, I. S.
Multiple fertilization in maize (*Zea mays* L.).
Philipp. Agric. 1958 : **42** : 6–11.

Gluščenko has reported that pollination of a parent recessive for two characters with a mixture of pollen from two parents, each dominant with respect to one of the characters in question, has resulted in F_1 individuals combining both dominant characters [cf. XXVIII, 28 and 2451]. He has ascribed this phenomenon to multiparental fertilization. Data obtained by the authors from crosses involving *yyWxWx*, *YYwxwx* and *yywxwx* genotypes failed to offer evidence of multiparental fertilization in maize. It is suggested that Gluščenko's results may be best explained by assuming that his material was heterozygous for complementary genes or included mixed or misclassified stocks.

1511 **High amylose corn.**
J. Agric. Food Chem. 1958 : **6** : 641–42.

Scientists of the US Department of Agriculture at the Northern Utilization Research and Development Division, Peoria, Ill. and others at the University of Missouri are said to have bred maize having starch with an amylose content of 82%. This result was obtained by combining two genes both known to increase amylose content. Attempts are now being made to introduce both these genes into high-yielding hybrids; one firm of maize breeders has already introduced one of these genes into such hybrids and has produced maize having starch with amylose contents of 50 to 60%.

1512 VINEYARD, M. L., BEAR, R. P., MACMASTERS, M. M. & DEATHERAGE, W. L.
Development of "amylomaize"—corn hybrids with high amylose starch: I. Genetic considerations.
Agron. J. 1958 : **50** : 595–98.

Twenty-one mutant stocks were used in a study of the effects of nine genes on the amylose fraction of endosperm starch. The three genes *ae*, su_2 and *du* showed most promise for the development of high amylose strains of maize. The amylose percentages were found for double and triple recessives involving various combinations of *ae*, *du*, su_1 and su_2 with other genes; also the 16 possible triploid endosperms involving interactions of *ae* x *du*, *ae* x su_2 and *ae* x *wx* were analysed for dosage effect on amylose production. The data indicated that there is a complex interaction between *ae*, *du* and su_2 and between these individual genes and other modifying genes; the quantitative modifiers vary in the different stocks.

Starch extracted from pollen grains of plants homozygous for *ae* had only the normal 27% amylose; there is no pleiotropy of the type shown by the *wx* gene on pollen starch. Linkage data confirmed that *ae* is on chromosome 5.

1513 Bear, R. P., Vineyard, M. L., MacMasters, M. M. & Deatherage, W. L.
Development of "amylomaize"—corn hybrids with high amylose starch: II. Results of breeding efforts.
Agron. J. 1958 : **50** : 598–602.

Crosses were made between 135 dent inbred lines and a mutant carrying the *ae* genes for high amylose content. Amongst the *ae* segregates, amylose contents ranging from 35 to 56% were found; this indicated the existence of a number of modifying genetic systems which influence amylose formation in the presence of *ae*. Also variations in amylose content were found within populations of individual *ae* or su_2 inbreds. The genes *ae*, *du* and *su* showed a wide range of phenotypic expression when combined with dent inbreds.

In a study of 14 *ae* x su_2 segregating F_3 populations, it was found that the highest amylose content is not restricted to the double recessive. The highest average amylose contents have been found where *ae* is present and su_2 is either heterozygous or entirely absent; in these populations, the amylose content is greater than that of the parents.

A procedure is suggested for breeding maize of high amylose content; this method involves recurrent selection for high amylose.

1514 Lebedeff, G. A.
Inheritance of loose pericarp in corn.
J. Hered. 1958 : **49** : 129–32.

Progress reports of this work have already been summarized [cf. XXVII, 1345 and XXVIII, 155]. Data are now presented indicating the absence of epistasis among genes controlling loose pericarp; the genes responsible for smooth grades of pericarp tend to have a stronger action than those determining the looser grades.

1515 Sidorov, F. F. & Zubkova, S. V.
(Descriptions of the cold and frost resistance of the maize collection).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. 4 : 16–22. [Russian].

Some flints and dents from the Netherlands and Germany were distinguished by frost resistance among many varieties, hybrids and inbred lines tested in the province of Leningrad. Next to these in resistance came early-ripening varieties from the northern districts of the Soviet Union and some land varieties from Rumania and Dagestan.

1516 Wernham, C. C.
"Standability" of corn. Good breeding—careful cultivation.
Sci. Fmr., Pa. 1958 : **6** : No. **1** : p. 5.

At the Agricultural Experiment Station of Pennsylvania State University, it was found that the stalks of some maize plants remained standing, although infected with stalk-rotting organisms. It appears that the outer tissues of the stalks in these plants were particularly tough and resistant to disease.

1517 Goth, R. W., Rowell, J. B. & Kernkamp, M. F.
Behavior of solopathogens from interspecific crosses of some *Sphacelotheca* spp.
Phytopathology 1958 : **48** : 494–97.

Monosporidial lines from interspecific crosses of a *S. reiliana* line with lines of *S. cruenta* and *S. sorghi* included three solopathogenic lines, i.e. lines which when inoculated singly into the host are pathogenic and produce sori with viable chlamydospores. Promycelial lysis and atypical promycelia with incomplete sets of sporidia were observed during germination of the chlamydospores of the solopathogens. Most monosporidial isolates from the chlamydospores were solopathogenic and in the remainder segregation for parental mating type occurred together with apparent segregation and recombination of cultural characteristics. Similar segregation was induced by α irradiation of sporidia of the original solopathogenic lines.

1518 Ishikawa, T.
An unstable strain of *Ustilago maydis*.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 213–22.

Strain T4001 underwent spontaneous mutation to the homocysteineless condition at a rate estimated as 1·4 x 10^{-3} per sporidium per generation. The mutants formed two groups with respect to reversion rate and are believed to have a pseudoallelic relationship. Under conditions of division, mutation rate per sporidium per hour increased almost proportionally with rise in temperature, the temperature coefficient being about 1·3 and activation energy 0·24 ev. Under conditions of nondivision, temperatures of 0–30° C. had no effect on number of mutants but at 35° and 37° C. the frequency of mutation increased considerably. Since the mutants had no selective advantage at the two last-mentioned temperatures, high temperature had the ability to induce mutation.

In an experiment with ultraviolet radiation, the survival curve was linear, and the curve for mutation rate rose linearly with low doses, reaching a maximum at 6×10^5 erg cm^2 and then showing a decline.

1519 Musijko, A. S.
(Supplementary pollination of maize).
Kukuruza (Maize) 1958 : No. 4 : 51–53. [Russian].

The progeny raised from the seed of supplementarily pollinated Dnepropetrovsk showed improved resistance to smut at Odessa and Imeretinskij Gibrid similarly treated gave offspring with improved resistance to *Fusarium* at the Georgian Breeding Station.

1520 Flangas, A. L.
Studies on the genetics of pathogenicity of *Puccinia sorghi* Schw.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1900 : 1954–55. (Abst.).

On the basis of the reaction of ecidial, clonal and inbred recombinants on two groups of differential maize hosts, a single locus for resistance being involved in the first group and at least three in the second, four cultures of *P. sorghi* were found to segregate into eight pathogenic types, six, three, two and one being found in the respective original cultures.

1521 Beck, S. D.
The European corn borer, *Pyrausta nubilalis* (Hübn.), and its principal host plant. IV. Larval saccharotrophism and host plant resistance.
Ann. ent. Soc. Amer. 1957 : **50** : 247–50.

When offered a choice of diet, larvae of *P. nubilalis* tend to feed selectively on material with the higher sugar content. The growth of newly hatched larvae was proportional to the sugar content of the host tissues when maize plants of identical size and variety were used, but on different varieties, varietal differences were not related to sugar content. Concentrates of two resistance factors A and B were prepared from the resistant variety W210D. The growth inhibition of larvae caused by A (ether-soluble) was inversely proportional to the glucose content of the diet, while that caused by B (ether-insoluble) was unaffected by sugar. It is suggested that the chief biological function of the borer's saccharotrophic response is its survival value in the presence of resistance factor A.

1522 Zahariadi, K. & Bratu, N.
(The resistance of maize to the action of herbicides).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. 1 : 134–36. [Russian].

Double crosses 312 and 332, derived from inbred lines of *Zea mays* var. *dentiformis*, were the most resistant to 2,4-D among the varieties and hybrids tested in Rumania.

1523 Miller, J. H.
Differential response of several inbreds and single crosses of corn (*Zea mays*) to 2,4-dichlorophenoxyacetic acid.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1132 : 1197–98. (Abst.)

Differential responses to 2,4-D among inbreds and single crosses, as indicated by data on yield, growth, morphological features and stalk breakage, are described. An association existed between parental inbreds and their single-cross progeny with respect to morphological responses and yield reductions.

1524 Rădulescu, E., Persică, E. & Rîpeanu, G.
Influenţa tratării seminţei cu temperaturi variabile asupra creşterii şi dezvoltării porumbului. **(The influence of treating maize grain with variable temperatures on growth and development).**
Stud. Cercet. Agron., Cluj. 1957 : **8** : 209–26.

The grain of a series of Rumanian varieties and hybrids was subjected to temperatures alternating between – 2–0° C. and 16–19° C. This treatment accelerates development but causes a reduction in plant height. Grain yield increased in some varieties; in others it decreased.

BARLEY

1525 Ward, D. J.
World collection of barley. Data compilation No. 6: Agronomic and pathologic data from plantings of 4,248 barley collection strains at Ames, Iowa; Brookings, South Dakota; Lincoln, Nebraska; and Ottawa, Ontario, in 1944.
US Dep. Agric., Agric. Res. Serv., Crops Res. Div., Pl. Industr. Sta., Beltsville, Md. undated : unpaginated. (Mimeographed).

Data are provided on growth habit, maturity class, heading date, plant height, straw strength, suitability of agronomic type and reactions to *Helminthosporium sativum* (*Cochliobolus sativus*), *H. teres* (*Pyrenophora teres*), yellow dwarf, leaf yellowing, bacterial blade blight and stem rust.

1526 SLINKARD, A. E.
The relationships in two barley crosses between F_2 plants and their progenies grown in hills.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1141 : 1200–01. (Abst.).

It was concluded that the hill method, instead of the conventional short progeny rows, could be used effectively in the F_3 or F_4 for evaluating heading date, maturity date, plant height, 200-kernel weight and percentages of plump and thin kernels, since relatively high estimates of heritability were obtained for these characters in hill plots and reasonably high correlations were found between data from such plots and rod-row plots.

1527 HAUS, T. E.
A linkage between two sections of a chromosome in barley.
J. Hered. 1958 : **49** : 179–80.

The gene a_{c_2} in linkage group III and y_c in VII were found to be linked, with a recombination value of 28·14 ± 1·59% based on combined F_2 and F_3 data. According to the data obtained by the author and other investigators, *n* for naked caryopsis (III) and *br* for brachytic plant (VII) are at opposite ends of the same chrom-some.

1528 LIVERS, R. W.
Linkage studies with chromosomal translocation stocks in barley.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1125 : p. 1225. (Abst.)

Linkages detected between translocations and genetic markers were as follows: C1358 (b–d) and *n* in linkage group III, 19·28% ± 2·85%; C1385 (a–b) and a_{c_2} in III, 7·57 ± 1·42%; C1420 (e–f) and *e* in I, 11·26 ± 2·27%; C1432 (c–e) and a_c in VI, 3·06 ± 1·40%; C1432 and x_c in VI, 3·90 ± 1·21%; C1432 and a_n in VI, 6·42 ± 1·99%; C1456 (a–e) and gl_2 in IV, 3·90 ± 0·87%; and C1483 (b–g) and *n* in III, 16·08 ± 2·03%. In addition, C1432 and *Bt*, one of two complementary dominant genes for brittle rachis, were found to be very closely associated. Linkage groups are assigned to the following chromosomes: I, f or e; II, a or e; III, b; IV, e; V, d or b; VI, c; and VII, probably b. The position of gl_2 has been identified as about mid-way between *K* and *Bl*. At least one of the complementary *Bt* genes belongs to VI. A new character termed multiflorous was observed, a ratio of 9 multiflorous : 7 normal segregates being obtained. This character showed no association with C1358, C1405, *R*, *S*, *T* or y_c. The postharvest dormancy of Colsess was associated with C1483 and with *S* (V).

1529 HAGBERG, A., GUSTAFSSON, Å. & EHRENBERG, L.
Sparsely contra densely ionizing radiations and the origin of erectoid mutations in barley.
Hereditas, Lund 1958 : **44** : 523–30.

The distribution of 69 *erectoides* mutants is analysed with respect to type of radiation and the 22 loci involved. The most interesting points emerging are as follows. Locus *a* has only undergone mutation as the result of acute γ or X irradiation. Locus *b* has mutated only in the barley Golden. Mutation at *c* is frequently produced through neutron treatment. Six of the *c* mutants are known to have originated in connexion with chromosome breakage at or close to locus *c*. Only one other mutant, *ert–d*^{7}, induced by X rays, has been found to be associated with breakage at or near the *ert* locus. Locus *r* is the only one which has been affected by dominant mutation, with X irradiation or neutron treatment. Loci *d* and *m* have both shown a high incidence of neutron-induced mutations, although these have arisen independently of breakage.

1530 STOY, V. & HAGBERG, A.
Effects of gibberellic acid on erectoides mutations in barley.
Hereditas, Lund 1958 : **44** : 516–22.

Using Bonus and *erectoides* mutants derived from this variety, experiments were carried out along the lines mentioned above at the Swedish Seed Association, Svalöf. Preliminary greenhouse experiments indicated that (1) application of drops of 2 μg. gibberellic acid in 10 μl. alcohol was the most satisfactory method of treatment, (2) time of application had a marked effect on the action of the growth substance on internode length of the ear, the most sensitive stage being about one week before meiosis, and (3) not all mutants give a similar reaction, out of the three tested, two (*ert–a*^{23} and *ert–c*^{47}) showing a positive response while the remaining one (*Ert–r*^{52}) was unaffected. In a field experiment on six mutants (*ert–a*^{23}, *ert–m*^{40}, *Ert–r*^{52}, *ert–c*^{47}, *ert–d*^{30h} and *ert–u*^{56}), the response of internode length in the ear was positive in all cases, but ranged from 59% in *ert–a*^{23} to 15% in *ert–d*^{30h}. Ear and straw length also increased except in *ert–u*^{56}, which showed a pronounced positive response as regards internode length in the ear but a slightly negative one in the case of ear and stem length. Normal Bonus responded as markedly as the mutants, giving the greatest response.

1531 GAUL, H.
Über die gegenseitige Unabhängigkeit der Chromosomen- und Punktmutationen. **(On the mutual independence of chromosomal and point mutations).**
Z. Pflanzenz. 1958 : **40** : 151–88.

X_1 heads obtained from irradiated barley seeds were ranked according to percentage spike fertility, and the number of X_2 chlorophyll mutants per 100 developed X_1 grains was determined for each fertility class. This expression, unlike such expressions as number of mutated ears/total number of ears or number of mutations/total number of plants, allows for the loss of mutants with increasing sterility [cf. XXVIII, 481]. The mutation frequency was found to be similar for all fertility classes.

In a second experiment, in which the expression number of mutated ears/total number of ears was used with a mathematical correction for loss of mutants with decreasing fertility, a slight increase in mutation frequency was generally detected in the higher fertility classes, although the opposite tendency was observed for one series in the experiment, in which growing conditions were such that numerous tillers were formed. The latter tendency is attributed to diplontic elimination of mutations, the former to gametic elimination. In both experiments the different mutant types were randomly distributed among the fertility classes. The results obtained indicate that chromosome mutations, which affect fertility, occur independently of the point mutations studied.

1532 POLLHAMER, E.
Mutációs kisérletek tavaszi árpa nemesítésében. II. Az MFB 104-es fajta mutáns gyűjteménye. **(Mutation experiments in breeding spring barley. II. The collection of mutants of the variety MFB 104).**
Növénytermelés 1958 : **7** : 11–26.

In experiments conducted at Martonvásár, Hungary, mutant types induced by exposure of the two-rowed spring barley Martonvásár FB 104 to radioactive cobalt were assigned to ten groups according to the following characters: number of rows per spike, fertility, spike density, length and thickness of the stem, leaf width, kernel shape, type of hull and awn, colour of stem and leaves, length of vegetative period and field resistance to powdery mildew. Six-rowed and four-rowed mutants occurred in higher frequencies than found by other workers and were highly viable. Early mutants were also frequent. No hulless or awnless types or mutants with bifurcate awns were obtained. Some of the mutants are now being crossed with MFB 104 with the aim of improving the earliness and mildew resistance of the latter.

1533 LAZANI, A.
(The question of improving the technique of grafting cereals).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 3 : 72–74. [Russian].

An account of embryo grafting of cereals at Cluj, Rumania, is given and the improved methods employed are described. The results include a vegetative hybrid barley L22, obtained from among grafts of Heines Hanna embryos ou the endosperm of Abed Opal or Isaria and a vegetative hybrid of the barley Genad* 396 grafted on the endosperm of an unspecified winter wheat. The progeny of the first-mentioned hybrid yields 15–30% more grain than Heines Hanna or the standard variety of barley at Cluj, and the progeny of the other hybrid shows improved winter hardiness and drought resistance.

1534 SERGEEV, V. Z.
(Directed changing of spring habit into winter habit in barleys).
Dokl. Vsesojuzn. Akad. selskohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 3 : 3–10. [Russian].

An extended account of a report already summarized is given [1540].

1535 MCKENZIE, R. I. H.
A comparison of F_3 lines and their related F_6 lines in two barley crosses.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1130 : 1182–83. (Abst.).

The main objectives of this study were (1) to evaluate testing for yield and other quantitative characters in the F_3, and (2) to determine the effectiveness of visual selection for yield potential and other desirable characters in the F_4 and F_5. Sixty-eight pairs of selections from Feebar x Montcalm and 74 pairs from Feebar x Kindred were tested in the F_6, each pair being derived from a separate F_2 plant. The members of a pair were the result of selection in positive and negative directions in the F_4 and F_5, with emphasis on apparent yielding ability. Replicated F_6 data were obtained for heading date, plant height, lodging resistance, visual yield score, yield, 200-kernel weight, bushel weight and percentage of thin kernels. Selection in the F_4 and F_5 affected most characters in both crosses, with the exception of yield. Only in the case of Feebar x Montcalm, however, were the differences arising through positive and negative selection found to be significant from the point of view of the breeder. Correlations between F_3 and F_6 lines were highest for heading date and successively lower for height, 200-kernel weight, bushel weight, percentage of thin kernels, yield, lodging resistance and visual yield score. Little or no association was detected between F_3 and F_6 yields in Feebar x Kindred, but the association was sufficiently high in Feebar x Montcalm to justify selection in the F_3. Although many correlations between characters were significant in Feebar x Kindred, few were large enough to be of value in breeding. A high positive association between heading date and amount of secondary growth was noted in this cross. In Feebar x Montcalm, correlations between yield and kernel characters were good. In addition, a method of screening large numbers of lines by eliminating replication and placing a control variety in every fifth row was investigated. Adjustments of the data on the basis of the performance of the control proved to be of little value.

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* ? Cenad.

1536 LAMBERT, J. W.
Registration of barley varieties, XIV.
Agron. J. 1958 : **50** : 708–11.

Descriptions are given of the following established commercial varieties which have recently been approved for registration by the US Department of Agriculture in cooperation with the American Society of Agronomy: Bonneville, Rogers, Spray, Mo. B–475, Frontier, Hannchen, Jackson 1, Peatland, Colonial 2 (selection of Colonial), Davie, Custer, Kindred, Traill, Tregal, Feebar, Moore, Odessa and Plains.

1537 TSUCHIYA, T.
(Caryotype studies with barley).
Senshokutai (Chromosome)/Kromosomo 1958 : No. 37–38 : 1294–312. [Japanese].

This comprehensive review deals with the following topics: caryotypes of the pure species, caryotypes of translocation stocks, caryotypes of trisomics, caryotypes of wild tetraploid species, nucleolar chromosomes, relation between caryotype and chromosome-mapping studies, the evolution of the caryotypes of cultivated barleys, and the light thrown by caryotype investigations on the taxonomic affinities between *Hordeum* and related genera.

1538 PAI, R. A. & NATARAJAN, A. T.
Karyotypes of some varieties of barley.
Proc. Indian Acad. Sci. 1958 : **48** : 122–30.

The karyotypes of six varieties bred at the Indian Agricultural Research Institute were investigated and idiograms of their chromosomes are presented. The relationship between structural differences in the chromosomes and the phenotypic distinctness of the different varieties is discussed with particular reference to the presence or absence of satellites.

1539 MOUTSCHEN-DAHMEN, J. & MOUTSCHEN-DAHMEN, M.
L'action du Myleran (di-méthane-sulfonyl-oxy-butane) sur les chromosomes chez *Hordeum sativum* et chez *Vicia faba.*
[The action of myleran (dimethanesulphonyloxybutane) on the chromosomes in *H. sativum* and in *V. faba*].
Hereditas, Lund 1958 : **44** : 415–46.

Details are presented of the chromosomal aberrations observed in root tip cells of *H. sativum* and *V. faba* after treatment with saturated solutions of myleran. The number of chromosome breaks increased with the length of the treatment in *Hordeum* but not in *Vicia*, at least during the first mitoses after treatment. For both species, the maximum number of breaks occurred in the second mitosis after treatment. In *Hordeum* breaks were observed most frequently near the constrictions, whereas in *Vicia*, they were mostly in the heterochromatic segments. No true bridges were noticed in either species. The only reunions observed were between acentric fragments. Rare occurrences of chromatid breaks and intrachromatid and interchromatid changes were noted in *Vicia*. Also in *Vicia*, the S chromosomes tended to decrease considerably in length but hardly any M chromosomes of greatly reduced size were found.

1540 SERGEEV, V. Z.
(An experiment on changing spring barley into winter barley using directed training).
Agrobiologija (Agrobiology) 1958 : No. 2 : 13–22. [Russian].

Local spring barleys from the province of Rostov gave rise to winter forms and hardy alternative forms on being sown for several generations as winter cereals. Some forms derived from Trebi and Mestnyj Četyrehgrannyj 14 [Local Four-rowed 14] exceeded such winter varieties as

Odessa 17 and Krasnyj Dar 1918 in winter hardiness and proved fairly productive on small plots in experiments carried out in 1957.

1541 DAVIES, D. R.
Male parthenogenesis in barley.
Heredity 1958 : **12** : 493–98.

A naturally occurring autotetraploid of *Hordeum bulbosum* ($2n = 28$) was crossed with a synthetic autotetraploid form of *H. vulgare*; seven seeds were obtained and three plants survived to maturity. Two of the plants closely resembled diploid *H. vulgare* in all characters except the branching of the stem; the third plant resembled *H. vulgare* in some but not all respects. Plant 3 flowered later and tillered more profusely than *H. vulgare*; it had the initial prostrate habit and dark green leaf colour of *H. bulbosum*. Some of the ears had long awned glumes and awned lateral florets as in *H. bulbosum*; also some of the florets were undeveloped and others had no ovaries or were deficient in stamens.

The three plants were diploid, chromosome pairing being complete. Plant 3 had a low chiasma frequency. In all cases, meiosis occurred at the same stage of floral development as in *H. vulgare*. On selfing and crossing with diploid *H. vulgare*, the seed set was complete. The progeny resembled *H. vulgare* and were completely normal. Back crossing the three original plants to tetraploid *H. bulbosum* was unsuccessful.

It was concluded that the three plants studied had arisen by the parthenogenetic development of the diploid nucleus from the pollen grain of tetraploid *H. vulgare*.

The anomalous features observed in the three plants are thought to result from a disharmony between the *H. vulgare* nuclear constituents and the *H. bulbosum* cytoplasm. It is also suggested that differences between and within plants could be attributed to quantitative differences in cytoplasmic factors, supposing these latter to be particulate and capable of segregation. Various ways in which quantitative differences in the plasmagenes could arise between cells are considered.

1542 SCHMIDT, H.
Beiträge zur Züchtung eiweissreicher Futtergersten. **(Contributions to the breeding of high-protein fodder barleys).**
Z. Pflanzenz 1958 : **40** : 189–214.

In trials carried out at three localities in Germany during 1955–56, statistically significant genotypically determined differences in grain yield, 1000-grain weight and content of crude protein were found among the 24 breeding lines and varieties studied. The absolute values, particularly for crude protein, varied according to locality, but the relative values were fairly constant. No correlations between crude protein content and grain yield or between crude protein and 1000-grain weight were detected. Density of stand showed a positive relation to grain yield and protein yield, but protein content was less dependent upon stand density while 1000-grain weight was positively related in four-rowed but not in two-rowed barleys. Four of the strains combined high grain yields with high protein content, two were characterized by high yields alone and three by high protein content alone; all these were six or four rowed summer barleys. It is concluded that breeding for high protein yields is feasible.

In another series of experiments involving late applications of N fertilizer to six different varieties, protein content and protein yield increased with higher N levels while grain yield and 1000-grain weight did not. Response to fertilizer treatment varied according to variety but was also affected by locality.

1543 **Parkland barley has malting quality.**
Crops & Soils 1958 : **11** : No. 1 : p. 21.

In tests held in Western Canada, Parkland has been equal or superior to the standard variety OAC21 in malting quality; it has excelled the latter in yield of heavy grade barley and in malt extract and has a lower nitrogen content. [Cf. XXVII, 1798].

1544 BANASIK, O. J. & HARRIS, R. H.
The malting quality of six north Dakota barley varieties.
Brew. Dig. 1957 : **32** : No. 11 : 60–64.

Three malting and three fodder barleys were tested at six stations in North Dakota over the period 1954–5. Malting quality of all six was significantly influenced by variety, locality and year. All locality x year interactions were significant.

1545 FIŠER, F.
Nova metoda za određivanje ječmenog ekstrakta. **(A new method of determining barley extract).**
Poljopr. Znanst. Smot. 1957 : **16** : 83–90.

The method described is based on that of Krapf, dry diastase being used instead of a malt filtrate; the estimation takes between two and three hours to complete. The results are presented of analyses of the grain of a series of Yugoslav and foreign varieties; this new method and others were used for the estimations.

1546 MORRISON, J. W.
Hordeum murinum in Holland.
Acta bot. neerl. 1958 : **7** : 654–64.

Nearly 100 samples of *H. murinum* collected from various districts in Holland were all found to have $2n = 28$. Since this species has previously been reported to have $2n = 14$, morphological characters were examined in detail to make certain that the plants conformed to earlier descriptions of *H. murinum*. It is concluded that the species has been erroneously listed as having $2n = 14$. An estimate of the variability in features used taxonomically was also made, an evaluation of their diagnostic value thus being possible. Mitotic observations on the size and shape of the chromosomes, together with a lack of quadrivalents at meiosis, indicated that *H. murinum* is not an autotetraploid.

1547 HANNAH, A. E.
The Canadian genetic stock collection of barley.
Cereal News 1958 : **3** : No. 5 : 4–8.

An account is given of the maintenance, evaluation and scope of the barley collection maintained at the Cereal Crops Division, Ottawa.

1548 OSANAI, K. & GOTOH [GOTO], K.
(Interaction between competitive ability and location in local strains of barley).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 83–88. [Japanese].

Five strains of the variety Hosogara 2 were used [cf. XXVI, 2327–8 and XXVII, 1790]. Their competitive abilities were ascertained by interplanting with three tester varieties at Kitami, Hokkaido. Marked differences between the strains in respect of competitive ability were observed; moreover, competitive ability at Kitami differed markedly from its manifestation at Mishima in Shizuoka, the best strain at Kitami (A–S) being the worst at Mishima.

A correlation was noted between winter hardiness, number of grains per plant and winter habit; however plants of spring habit compete advantageously with those of winter habit.

1549 MOSEMAN, J. G. & SCHALLER, C. W.
Separation of genes conditioning resistance to *Erysiphe graminis* f. sp. *hordei* by two pathogenically different cultures.
Phytopathology 1958 : **48** : p. 463.

The gene Ml_a determined the resistance of the barley Algerian to both cultures [CR3 (California race 3) and 061]. Ricardo was susceptible to 061. Its resistance to CR3 depends on a single gene designated Ml_{a3}.

1550 DAVIES, D. R. & WALL, E. T.
Artificial mutagenesis in plant breeding.
Nature, Lond. 1958 : **182** : 955–56.

Among 18,490 R_2 seedlings obtained after γ-ray or thermal-neutron irradiation of dormant seeds of the barley Proctor, no viable plant showing any degree of resistance to *Erysiphe graminis* f. *hordei* was found. A consideration of the data obtained by Hänsel and Zakovsky [cf. XXXII, 2980], who found 190 greenhouse-resistant and 72 field-resistant lines among 15,000 X_3 lines of Vollkorn, indicates that in this variety many hundreds of loci are involved in the determination of mildew resistance. On the basis of these contradictory results, it is suggested that for successful mutation breeding a thorough knowledge both of the dominance relationships of any genes controlling the characters required and of the number of loci involved is necessary. A further complicating factor is the fact that genes controlling similar processes may have different mutation rates.

1551 REED, H. E.
Studies on barley scald.
Bull. Tenn. agric. Exp. Sta. 1957 : No. 268 : Pp. 42.

Considerable variability in cultural characteristics was shown by isolates of scald (*Rhynchosporium secalis*) obtained in the USA and Canada. Ratings for susceptibility among 24 barley varieties inoculated in the greenhouse with 20 isolates agreed in most cases with ratings under field conditions at Knoxville, Tenn. The following varieties out of the 24 varied more than the others in susceptibility to the 20 isolates, indication of physiological races of the pathogen thus being provided: Mars, Chevron, Vaughn, Quinn, Calif. Mariout, West China and Tennessee Winter. These varieties were all resistant to four isolates and all susceptible to one isolate but quite variable in reaction to the remaining 15. Comparison of the susceptibility of 115 varieties in the field at Knoxville with their reactions in Argentina, Mexico, Missouri and California revealed differences in susceptibility in over one-fourth of the varieties at any two places, and thus gave further evidence of the occurrence of physiological races. The majority of cultural mutants were nonpathogenic, while all the parent cultures were pathogenic. Study of the nuclear condition of the mycelium and conidia, together with failure to find the perfect stage, led to the conclusion that cultural and pathogenic variation must be the result of mutation of the original nucleus in the one-celled conidium. Field observations in 1951 disclosed that most barleys recommended for Tennessee were susceptible and that 85% of the varieties and selections used in breeding were also susceptible. Many of the barleys from the world collection have however remained highly resistant at Knoxville.

1552 SCHEIN, R. D.
Pathogenic specialization in *Rhynchosporium secalis.*
Phytopathology 1958 : **48** : 477–80.

Argentine differential barley varieties used in an earlier study [cf. XIX, 981] were all attacked by most isolates of *Rh. secalis* obtained from different areas in the USA; but by means of a new series of six differential varieties, seven races could be distinguished. In host range studies, an isolate from barley was able also to attack species of *Agropyron*, *Bromus* and *Festuca*.

MILLETS AND SORGHUMS

1553 ANSLOW, R. C. & BELCOURT, M. S.
Fodder production from *Setaria sphacelata* in Mauritius. I. Strains and growth habit, establishment, productivity and fertilizer response. II. Feeding value.
Rev. agric. sucr. Maurice 1958 : **37** : 115–20.

Two strains of *S. sphacelata* introduced into Mauritius from Rhodesia are briefly described.

1554 ALEKSEEVA, E. S.
(The breeding of *Setaria italica* using the method of hybridization).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : **1** : 140–42. [Russian].

An account of breeding *S. italica* for productiveness and earliness at the Williams Forage Institute is given and the breeding material and methods employed are described. The results include a hybrid of Baškir ♀ x Belozernyj [White-grained] ♂ which has a shorter growth period than the early maternal parent and outyields the productive pollen parent by 36%.

1555 GILDENHUYS, P. & BRIX, K.
Cytological abnormalities in *Pennisetum dubium.*
Heredity 1958 : **12** : 441–52.

P. dubium is the name suggested for a type of *Pennisetum* collected in the Ermolo district of the Eastern Transvaal. Clones and seedlings showed varying numbers of chromosomes in the same root tip; the numbers varied from 14 to 84 in root-tips and 47 to 74 in pollen cells, the most frequent number being 66 in both cases. Root-tip cells with several nuclei were observed; the divisions of these nuclei were not usually simultaneous. Also the chromosomes arising from a single nucleus sometimes formed groups, which underwent mitosis at different times. In some cases, single chromosomes were scattered apparently at random in the cytoplasm. At metaphase some groups were not orientated on the equator; tripolar, quadripolar and split spindles and lagging chromosomes were also observed. Cells with telophase nuclei often had micronuclei or single chromosomes scattered in the cytoplasm.

In the pollen mother cells, the abnormalities were similar to those in the root-tip cells but less frequent and less intense. Two or three nuclei were found in some pollen mother cells; these consisted of (1) binucleate cells which had arisen through failure of cell division and (2) binucleate cells in which one of the nuclei had undergone a reduction division. The occurrence of tripolar and quadripolar spindles accounted for the presence of two nuclei in the cells of some interphase dyads. Grouping of chromosomes occurred at all phases of both divisions; stickiness, which frequently resulted in clumping, was also observed. There was considerable variation in chromosome association and the distribution at anaphase. After the first division in the pollen mother cells, there was a reduction in chromosome number; the most frequent complement was $n = 23$. Pollen grains with 14 chromosomes were found to be viable.

From these studies it is concluded that either a new basic chromosome number should be added to those already known for the genus *Pennisetum* or that *P. dubium* has arisen as a hybrid between $x = 7$ and $x = 9$ forms.

1556 ROSBACO, U.
La producción de semilla de sorgo híbrido en Estados Unidos. **(The production of hybrid sorghum seed in the United States).**
Idia 1958 : No. 127 : 17–19.

The production of hybrids with the aid of cytoplasmic male sterility is briefly described.

1557 CRAIGMILES, J. P., HARRIS, M. B., NEWTON, J. P. & DOBSON, J. W.
Heterosis in F_1 hybrids of *Sorghum vulgare* x *S. sudanense* and *S. vulgare* x *S. arundinaceum*.
Agron. J. 1958 : **50** : 714–15.

Male-sterile combine Kafir 60 was crossed in interplantings with (1) *S. sudanense* 'Tift' and (2) Rhodesian Sudan grass (*S. arundinaceum*). The F_1 hybrids, Sudan grass parents and four hybrid forage sorghums (NK3055, NK3065, DeKalb 1–49–93 and Frontier S–210) were planted in a randomized block design at three centres in Georgia. The forage sorghums were substituted for the Kafir parent, a grain type producing a low yield of forage, so that a practical comparison could be made between the interspecific hybrids and forage sorghum. The hybrids were significantly superior to their respective Sudan-grass parents and to forage sorghum in production of dry matter per acre at each centre. The F_1 hybrids were 11% less leafy than Sudan grass, with broader leaves and thicker stems. They resembled the sorghum parent in seed characteristics and in having open panicles. Such hybrids offer the possibility of developing a forage-grain type which could be used for ensilage, grazing or hay. The open panicles would render the crop suitable for mechanical harvesting and minimize damage due to insects and diseases. The cytoplasmic ♂ sterility of Kafir 60 has been transferred to Rhodesian Sudan grass but ♂ sterility has not been readily transferred to Tift on account of the presence of restorer genes. With the development of ♂-sterile Sudan grass, the ultimate aim of hybrid Sudan grass could soon be achieved.

1558 FRANZKE, C. J.
Dual, an early grain and forage sorghum.
Bull. S. Dak. agric. Exp. Sta. 1958 : No. 467 : Pp. 4.

Dual originated as a true-breeding variant obtained by colchicine treatment of a complex cross having the following parents: a colchicine-induced variant from Experimental 1 [(Dwarf Feterita x Dwarf Freed] x Grohoma], a colchicine-induced variant from (Modoc x Kaoliang) x [Yellow Kafir x (Dwarf Feterita x Dwarf Freed)], and Experimental 3 [(Day Milo x Rancher) x (Sudan grass x Day Milo)]. The variety is expected to become popular as a type for grain, fodder and silage in all sorghum-growing areas in S. Dakota. It is early ripening and bears spreading panicles well above the flag leaves.

1559 SHARMA, A. K. & BHATTACHARJEE, D.
Chromosome studies in *Sorghum*. I.
Cytologia, Tokyo 1957 : **22** : 287–311.

The caryotypes of the following species are described: *S. sudanense*, *S. margaretiferum*, *S. guineense*, *S. roxburghii*, *S. membranaceum*, *S. dochna*, *S. caffrorum*, *S. nigricans*, *S. caudatum*, *S. durra*, *S. halepense*, *S. versicolor*, *S. verticilliflorum*, *S. elegans*, *S. nervosum*, *S. purpureosericeum*, *S. vulgare* and *S. subglabrescens*. A chromosome number of $2n = 20$ was found in all cases, except *S. halepense* ($2n = 40$) and *S. versicolor* and *S. purpureosericeum* with $2n = 10$. Several distinct types of chromosomes, common to all the species, were recognizable on the basis of the positions of primary and secondary constrictions and relative size. Each species was caryotypically distinct. The number of chromosomes with secondary constrictions varied from 14 in *S. guineense* to 4 in *S. purpureosericeum*. In some species, e.g. *S. nigricans* and *S. caffrorum*, fragments, which were attributable to breakage of normal chromosomes, were observed in root-tip cells but not at meiosis. Evidence was also obtained of intraspecific disparities in caryotype in the case of species of which more than one strain was studied. Normal bivalent formation occurred in all the species in which meiosis was investigated. Secondary association was of regular occurrence in *S. vulgare* and a number of other species. The maximum association in all these species consisted of four groups of chromosomes. In discussing the problem of the basic chromosome number of the genus, the authors suggest the following mode of evolution as being the most likely. Species with $n = 5$ originated from $n = 4$ types through duplication and concomitant structural changes, while species with $2n = 20$ subsequently arose from $n = 5$ types as the result of allopolyploidy.

1560 RAMAKRISHNA REDDY, V.
On the differentiation of A and B chromosomes of *Sorghum purpureosericeum* at pachytene.
J. Indian bot. Soc. 1958 : **37** : 279–89.

The five A chromosomes and two types (short and long) of supernumerary or B chromosomes were studied at pachytene with respect to their size and shape and the sequence and stainability of the chromomeres. With the exception of the short arm of the nucleolar chromosome, each A chromosome was characterized by a gradient in chromomere size on either side of the centromere, with the size and stainability of the chromomeres showing a gradual decrease distally. The entire short arm of the nucleolar chromosome was composed of deeply staining chromomeres distributed in two segments. The gradients in chromomere size are regarded as being under the direct influence of the centromeres. The centromeres of the A type and pair of long B chromosomes were essentially similar in their structural organization, showing in common lightly staining fibrillae connecting the centromere with the arms and a middle zone consisting of two pairs of chromomeres. The B chromosomes lacked the gradient in chromomere size typical of the A type. It is suggested that the abnormal behaviour of the B chromosomes at mitosis in this species and their non-disjunction at second pollen mitosis are due to their markedly heterochromatic nature rather than to functional inadequacy of their centromeres.

1561 Krishnaswamy, N. & Meenakshi, K.
Abnormal meiosis in grain sorghums —desynapsis.
Cytologia, Tokyo 1957 : **22** : 250–62.

Of the two desynaptic types described, the first (Dsy–1) was found in the F_6 of *S. durra* var. *coimbatoricum* x *S. caudatum* x *S. durra* var. *coimbatoricum* and the second (Dsy–2) in a pure line of *S. subglabrescens*. The mean frequency of bivalents per PMC was 6·5 in Dsy–1 and 0·62 in Dsy–2. Except for desynapsis and its consequences, meiosis was normal. Both types had a high degree of ♂ and ♀ sterility, Dsy–2 being the least sterile. Desynapsis was not associated with any morphological variation or decrease in vigour. Dsy–1 and Dsy–2 behaved as though dependent on single recessive genes, respectively designated as^1 and as^2. The origin of each type is ascribed to mutation. Further work is being carried out on selfed progenies and crosses of the two types with diploids and tetraploids. It is suggested that, especially in Dsy–2, ample opportunity exists for the production of unreduced gametes and thus for apomixis.

1562 Qazi, A. Q., Chand, A. A. & Staffeldt, E. E.
Comparative study of different varieties of jowar (*Andropogon sorghum*) as affected by *Tolyposporium ehrenbergii* and *Colletotrichum* sp.
Pakist. J. sci. Res. 1957 : **9** : 117–18.

Among tall varieties tested in Pakistan one local variety and two introduced varieties were highly tolerant of *Colletotrichum*, one local variety was fairly tolerant and nine local varieties were susceptible. The resistance of some varieties was affected by stand density. Of the introduced dwarf grain-sorghums, nine were highly tolerant of *Colletotrichum* and three fairly tolerant. Six out of nine introduced fodder sorghums were highly tolerant of *Colletotrichum*, one of these being susceptible to *T. ehrenbergii*.

RICE

1563 Piacco, R.
Il miglioramento del riso nei principali paesi risicoli. (**Rice breeding in the main rice-growing countries).**
Sementi elette 1958 : **4** : No. 5 : 14–21.

A brief historical outline is given of rice breeding in Japan, Indonesia, the Philippines, India, Ceylon, the French Sudan, the Belgian Congo, the USA, Spain and France. Special mention is made of the use of hot water or air for inducing flower opening or for emasculation in a number of places and some of the most notable of the varieties produced are named.

1564 Horváth, P.
A magyar rizstermesztés fajtakérdései. (**Varietal problems in Hungarian rice growing).**
Magyar Mezőgazaság, Budapest 1958 : No. **2** : p. 10 [from Hungar. agric. Rev. 1958 : **7** : No. **3** : p. 2.] (Abst.).

The variety Ömirt 39, related to Dunghan Shali, has done well in trials. The Italian variety Precoce Allorio [Allorio Early] and the lodging-resistant, nonshattering Rumanian rice line 45 have both proved highly productive but are later than the Ömirt varieties.

1565 Cada, E.
Rice seed: its improvement, production and distribution in other Far Eastern countries.
Pl. Industr. Dig., Manila 1958 : **21** : Nos. 7–8 : 24–26, 34, 40.

Programmes of breeding and seed multiplication and distribution in Taiwan, Japan and Thailand are outlined and compared with procedures used in the Philippines.

1566 **The production of superior rice varieties at the Maligaya Rice Experiment Station.**
Pl. Industr. Dig., Manila 1958 : **21** : Nos. 7–8 : p. 29.

Progress achieved at the above station in the Philippines by introduction of varieties, pure-line selection and hybridization is outlined.

1567 Nei, M. & Syakudo, K.
Genetic parameters and environments. II. Heritability and genetic correlation in F_2 of some agronomic characters in rice plant.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 235–41.

The material studied comprised the varieties Sekitori 10 [Champion 10], Ginbozu [Silver Bonze] and Kameji and F_2 populations of Sekitori 10 x Ginbozu and Kameji x Sekitori 10.

The quantitative characters measured were panicle number, culm length and panicle length; two sowing times were used: 23 May and 7 June. It was found that, though the mean values for all characters usually decreased with late sowing, the genotype x sowing time interaction was not significant, possibly because of small population size. Estimates of heritabilities of the three characters and of predicted genetic advance are derived.

1568 Jodon, N. E.
Revision of figure 3 to 6, "present status of rice genetics".
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1956 : No. 14 : 69–73.

Further to his earlier review of linkage data in rice [cf. XXIV, 943 and XXVI, 2393], the author incorporates some additional data published by Ramiah [XXIV, p. 655] relating to linkage groups I–VIII.

1569 Nakajima, T. & Morishima, H.
(**Studies on embryo culture in plants. II. On embryo culture of interspecific rice hybrids**).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 105–10. [Japanese].

F_1 hybrids were raised from crosses between 2*n* or 4*n* *Oryza sativa*, on the one hand, and *O. minuta* or *Oryza* 'Paraguay', on the other, after culturing the embryos on White's agar. These crosses are normally unsuccessful [cf. 148].

1570 **Rice mutant looks favorable.**
Agric. Res., Wash. 1958 : **7** : No. 3 : p. 13.

A radiation-induced mutant of Rexoro ripens 4–5 weeks earlier than the parent variety. It produces grains typical of Rexoro but has fewer tip awns and very few tillers. The mutant should prove valuable in breeding for earliness.

1571 Tinarelli, A.
Una nuova varietà di riso "Trionfo Fassone". (**A new rice variety, Trionfo Fassone**).
Riso, Milano 1958 : **7** : No. 9 : 8–10.

The variety Trionfo Fassone [Fassone Triumph] was produced by F. Fassone from plants selected from a field of Maratelli in 1955 and thought to be natural hybrids of Balilla; it has short strong straw that does not lodge, gives a high yield of grain 8·95 mm. in length, with an unusually low husk percentage varying from 15·70 to 16%, and is free from shedding.

1572 Johnston, T. H.
Registration of rice varieties.
Agron. J. 1958 : **50** : 694–700.

Information is given on the origins, characteristics and performance of the following varieties, which have been registered by the US Department of Agriculture in cooperation with the American Society of Agronomy: Arkrose, Bluebonnet, Bluebonnet 50, Blue Rose, Caloro, Calrose, Century Patna, Colusa, Fortuna, Improved Bluebonnet, Lacrosse, Magnolia, Nato, Rexoro, Sunbonnet, Texas Patna, TP49, Toro, Zenith, Cody, Nira and Mo. R-500. Most of these varieties have been established commercially for a considerable period.

1573 Serrano, F. B.
New rice hybrids and their commercial possibilities.
Philipp. J. Sci. 1956 : **85** : 263–82.

The following new hybrids developed in the Philippines are described. Buenketan, a natural hybrid between Buenavista (= Kasungsong) and Ketan Koetoek, is stiff strawed, nonshattering and highly resistant to stunt, blast and stem borers. The leaf sheaths, stems and panicles have a purplish tinge. The kernels are large and long and high in quality. Buenketan 99 is the best strain. Milketan is a natural hybrid between Milagrosa and Ketan Koetoek. It differs from Buenketan in the lack of purple coloration. Milketan 20 is a nonglutinous and Milketan 21 a glutinous strain; both are better than the parents in yield and quality. Milfor, derived from an artificial cross of Milketan and Fortuna, is adapted to lowland, palagad and upland planting. It is stiff strawed, tillers well, resists shattering and produces large, long grains, good in quality. Milbuen was produced by crossing Milfor and Buenketan and surpasses its parents in yield, quality and resistance to pests, diseases and inclement weather. Milbuen strains are as widely adapted as those of Milfor.

1574 Huang, C. W.
(**A study of the cultivated varieties of Taiwan native rice**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1957 : No. 20 : 27–58. [Chinese].

A detailed study of the botanical and agronomic characters of 141 varieties of the above type is presented. Information is provided on leaf, culm, panicle, spikelet and grain characters, pigmentation, vegetative cycle and yield. The varieties are classified into 47 groups, firstly according to whether they are early-season or late-season types, and then according to glutinous or nonglutinous grain, maturation period, height, tillering, grain shape and grain size.

1575 Seshu, D. V. & Venkataswamy, T.
A monosome in rice.
Madras agric. J. 1958 : **45** : 311–14.

A highly sterile plant in the F_5 of a cross between the *indica* rice T1145 and *japonica* type Taihoku had $2n = 23$. It is assumed that the monosomic arose as the result of nondisjunction of a bivalent in the F_4. A progeny consisting of 45 plants which were uniform in appearance and highly sterile was obtained from the monosomic. The plants sampled were diploid. The sterility of the monosomic and its progeny is attributed to genic unbalance resulting from interracial hybridization.

1576 Hu, C.-H.
(Studies on the chromosome complement of cultivated rice).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 21 : 11–23. [Chinese].

Further to studies already reported [XXVII, 3810 and XXVIII, 1707], the author investigated mitosis and meiosis in eight haploid strains, five *japonica* varieties and three *indica* forms. The set of twelve chromosomes comprises 4 medianly constricted and 3 subterminal chromosomes. A tendency towards somatic pairing was noted at mitosis, the most complex grouping being 4(2) + 1(3) + 1(1). The modal configuration at meiosis was 12_{I} but secondary associations as complex as 2(3) + 3(2) were noted. These observations are regarded as confirming the view that the basic genome in rice comprises five chromosomes.

1577 Murata, Y. & Osada, A.
(Studies on photosynthesis in rice. X. Photosynthetic characteristics of rice varieties and dry-matter production).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 12–14. [Japanese].

Photosynthetic ability, respiration rate and dry-matter accumulation were studied in nine varieties under normal and heavy conditions of manuring. Dry-matter production in the later stages of growth was principally determined by photosynthetic ability as long as insolation was adequate, otherwise respiration rate played the determining role.

1578 Čen', S.-Č. [Chen, S.-C.]
(A comparative study of the growth period of some irrigated rice varieties).
Agrobiologija (Agrobiology) 1958 : No. 3 : 83–86. [Russian].

Observations on the growth period, tillering, earing, flowering and grain development of rices in the province of Chekiang are presented, varietal differences being noted.

1579 Petrasovits, I.
A rizs csírázására vonatkozó vizsgálatok. **(Studies on rice germination).**
Növénytermelés 1958 : **7** : 27–36.

In studies conducted at Szarvas, Hungary, Dunghan Shali germinated more quickly than Precoce Allorio [Allorio Early] or Kendzo and had a smaller heat requirement. Varietal differences in the decrease in percentage germination resulting from treatment of the seeds with water at 5·8–6·7° C. for periods of 3–11 days were also noted.

1580 Ouang [Wang], T.-Y.
(Studies on the improvement of early rice in Taiwan. I).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 21 : 44–49. [Chinese].

A varietal test of twelve early-maturing varieties, ten introductions from the Chinese mainland and two native rices, using both early and late planting, is reported. The introduction Nan-te-hao [Southern Special] did best both under early and late cultivation.

1581 Kawase, T. & Murata, N.
(Studies on the relation between the expression of genically determined characters and environment. I. The response of genes E_1 and E_2 to day length in rice).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 95–99. [Japanese].

The four genotypes E_1E_2, E_1e_2, e_1E_2 and e_1e_2 [cf. XXV, 308] were grown under a variety of photoperiodic treatments. The time of ear-primordium differentiation is principally determined by the critical day length and this was found to be affected more by E_1 than E_2.

1582 Asakuma, S.
(Ecological studies on heading in rice. I. On some factors concerning number of days to heading. II. On the basic vegetative growth habit, sensitivity to light and sensitivity to temperature of Japanese rice).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 61–66. [Japanese].

In the first set of experiments, six varieties were grown at four different densities after both early (20 March) and late (12 July) sowings. Density had little effect on heading but all varieties developed much more rapidly in the late sowings. In the second set of experiments, a much larger set of varieties was used; early and late sowings were again employed and in each sowing some plants of each variety were subjected to normal photoperiods while others were subjected to short-day treatment. From the result of these experiments, the author distinguishes between two varietal characteristics, x the uneffective temperature, and y, the effective temperature, defined as follows:—

x = difference between the accumulated temperatures for the two sowing treatments/difference between the heading periods for the two treatments, and

$y = n.$ (average daily temperature) $- n.x$, where n = number of days to heading.

The value of x is smaller in early varieties than in late.

1583 Yao, S. Y., Henderson, M. T. & Jodon, N. E.
Cryptic structural hybridity as a probable cause of sterility in intervarietal hybrids of cultivated rice, *Oryza sativa* L.
Cytologia, Tokyo 1958 : **23** : 46–55.

A detailed account is given of investigations which have already been briefly reported [XXVII, 1340].

1584 Yamada, I.
(Artificial germination of rice pollen. VI. Protoplasmic streaming in the pollen tube. VII. The relation between protoplasmic streaming and temperature).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop. Sci. Soc. Japan) 1958 : **27** : 58–60. [Japanese].

The movement of protoplasm in the pollen tubes has two components, (1) streaming and (2) rotation. The rate of streaming was high at first in Japanese varieties and then fell; in introduced varieties it was low throughout. The optimum temperature for streaming during the initial active period of the Japanese varieties was 30° C.

1585 Hogan, J. T. & Planck, R. W.
Hydration characteristics of rice as influenced by variety and drying method.
Cereal Chem. 1958 : **35** : No. 6 : 469–82.

When presoaked samples of raw milled rice were treated with water at high temperature, varietal differences in water absorption by the kernels and in amounts of undissolved and dissolved solids in the water were found to be directly related to grain type and to cohesiveness and other cooking characteristics, long-grained varieties having low values for each of the three hydration properties measured and short-grained varieties high values, with medium-grained varieties occupying an intermediate position. The relationship of (*a*) water absorption, (*b*) undissolved solids and (*c*) dissolved solids with cooking qualities was shown when the treatment was carried out at (1) 70° C. for 20–30 min., (2) 98° C. for 30 min. and (3) 70° C. for 30 min., respectively.

1586 ten Have, H.
De invloed van het tijdstip van de oogst op de kwaliteit van enkele rijstrassen. I. **(The effect of date of harvest on the quality of some rice varieties. I.).**
Surinaam. Landb. 1958 : **6** : 40–53.

Moisture content in each of five long-grained varieties grown in Surinam decreased with progressively later harvest dates but the breakage percentage on milling first decreased to a minimum and then rose. Intervarietal differences in proportion of breakage were noticeable except at the stage of minimum breakage.

1587 Piacco, R.
Introduzione di varietà di riso argentine. **(Introduction of Argentine rice varieties).**
Sementi elette 1958 : **4** : No. 3 : 16–24.

The grains of most Italian rice varieties being more or less pearly, a number of Argentine rices have been tested, in the attempt to find vitreous types suitable for the European market. Eight of them are described briefly. Most of them had defects of some kind, the most interesting being Japonesito de tres meses [Small Three-months Japanese]; though mixed it was short, with straw 106 cm. high, and early; selection from it has led to the production of a promising line, referred to as 323/57, which matures in 160 days and has strong straw 97 cm. high; its yield is high and the grain is vitreous, with dimensions of 5·2 x 2·9 x 1·8 mm.

It is pointed out that no correlation was observed between the relative earliness of the varieties when grown in Italy and their time of maturity in their country of origin.

1588 Moriwaki, T.
(Studies on the response of rice varieties to cold water. I. On intervarietal differences in the number of pollen grains adhering to the stigma).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 43–44. [Japanese].

Four varieties, two resistant and two susceptible to the adverse effects of cold-water irrigation, were subjected to four different water temperatures. Low temperature brought about a reduction in the number of pollen grains adhering to the stigma but there was a positive correlation between the number of adherent grains and resistance.

1589 Murakami, K., Kawaguchi, K. & Mizushima, U.
(On chemical anomalies in the tissues of the anthers of rice subjected to low temperature and on intervarietal differences in this respect).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 119–27. [Japanese].

Two cold-resistant varieties, Fujisaka 5 and Towada, and one susceptible variety, Norin 16 [Ministry of Agriculture and Forestry 16], were subjected to treatments of 9–10° C. for 1 day or 17° C. for five days during the summer. The low-temperature treatment caused a marked increase in the content of reducing substances, presumably sugars, in the endothecial layers and an accompanying decrease in polysaccharides, these effects being more marked in the case of the susceptible variety. It therefore appears that low-temperature injury to the anther results from inhibition of nutrient transfer from the endothecium to the pollen mother cells or pollen.

1590 Ou, S. H. & Lin, K. M.
Preliminary report on rice breeding for blast disease resistance in Taiwan.
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 21 : 50–58.

Sources of resistance to blast occur among native Taiwan varieties, Taiwan mountain varieties, glutinous varieties and occasionally Peng-lai (= Horai) varieties. Numerous crosses have been made between varieties of the above four categories and agronomically desirable Peng-lai forms. A negative correlation appears to exist, however, between blast resistance and desirable agronomic characteristics. Resistance appears to be incompletely dominant.

Some improvement in blast resistance has resulted from X-irradiation or Co^{60} treatment of the widely grown but blast-susceptible variety Tai-chung 65.

Variation in degree of resistance to blast of some varieties in respect of year and locality has been noted; possibly physiological specialization of the pathogen is involved.

1591 Jennings, P. R., Rosero M., M. J. & Burgos Uribe, L. J.
Hoja blanca del arroz. **(White leaf of rice).**
Agricultura trop. 1958 : **14** : 511–16.

It is noted that a programme for transferring resistance to the virus causing the above disorder from varieties with short or medium grain to long-grained, high-yielding varieties has been initiated at the Palmira Agricultural Experimental Station, Colombia.

1592 Reyes, G. M.
La enfermedad del nanismo del arroz en las Filipinas. **(Dwarf disease of rice in the Philippines).**
Bol. Assoc. Téc. azuc. Cuba 1958 : **17** : 567–70.

This is a Spanish version of an article already summarized [XXVIII, 1720].

1593 Velasco, J. R. & dela Fuente, R. K.
The response of forty-six rice varieties to photoperiod.
Philipp. Agric. 1958 : **42** : 12–17.

Fifteen of the varieties were classified as weakly and 25 as strongly photoperiodic. The remainder gave a day-neutral response. Most varieties from latitude 0 to 20° showed a strong photoperiodic reaction, whereas weak and strong responses were equally represented among varieties from higher latitudes.

1594 Katayama, Y. & Shida, S.
Studies on the variation of leaf pigments by means of paper chromatography. I. Relative contents of chlorophylls and carotenoids in rice leaves.
Cytologia, Tokyo 1957 : **22** : 360–69.

A report is given of investigations carried out to develop a paper-chromatographic method of measuring the above pigments. The material used comprised the varieties Zuiho, Murasaki [Purple] and Koganenishiki, respectively characterized by green, purple and yellow leaves. [Cf. XXVII, 3033].

FORAGE GRASSES

1595 van Bogaert, G.
Rapport de la réunion de la section "plantes fourragères d'Eucarpia". (Milan 24–26/3/1958). **[Report of the meeting of the section "Forage plants of Eucarpia" (Milan, 24-26/3/1958)].**
Rev. Agric., Brux. 1958 : **11** : 845–46.

Six papers were presented at this meeting. Wit spoke on the problems and general methods of breeding forage plants, whilst Hutlin dealt with breeding from the point of view of increasing productivity. Breeding for eelworm resistance in forage plants was the subject of Bingefors' paper and Hertsch spoke on polyploid breeding of forage plants. Rebischung was concerned with breeding for disease resistance in grasses and Wexelsen dealt with disease resistance in diploid and tetraploid red clover.

1596 Jones, E. T.
The present position with regard to grass strains and the future outlook.
J. Inst. Corn Merch. 1958 : **6** : 206–18.

The author reviews current work being carried out at the Welsh Plant Breeding Station, Aberystwyth, on grass and legume breeding and techniques of strain assessment [cf. 153 and 155]. The problems of strain adaptability, source of seed, seed authenticity and the multiplicity of herbage varieties are also discussed.

1597 Panella, A.
Foraggere di varia provenienza in osservazione sull'Appennino umbro. (**Forage plants of various provenance observed in the Umbrian Apennines**).
Sementi elette 1958 : **4** : No. 2 : 18–27.

Observations on a number of grass and legume varieties introduced from America showed some of them to be superior to local Italian strains in vigour or other qualities. This applies to *Lotus corniculatus* 'Cascade', *Trifolium subterraneum* 'Oregon', *Bromus inermis* 'Lincoln', *Dactylis glomerata* 'Belts', *Phleum pratense* 'Marietta', *Arrhenatherum elatius* 'Tualatin', *Agropyron intermedium* and *A. trichophorum*.

Better plants and livestock.
Farmers' and Scientists' Joint Conference held at University of Western Australia, 11th & 12th February, 1958 : Pp. 51.

1598 *Bailey, E. T. Plant introduction.* (*pp. 28–29*).

Possible lines of improvement of pastures in Western Australia by the introduction of species from other areas in the world with similar climates are discussed. Points emphasized include: methods of obtaining seed, testing methods and the need for selecting suitable strains of each species.

1599 *Millington, A. J. Breeding as an aid to producing superior pasture plants.* (*pp. 29–30*).

The importance of developing a well adapted variety is emphasized and some of the breeding and selection methods available are briefly discussed. The subterranean clover breeding programme at the Institute of Agriculture of the University of Western Australia is described to illustrate the article.

1600 *Discussion.* (*p. 30*).

Among the points raised in the discussion following the above two pages were: the value of late varieties of subterranean clover, the development of more vigorously-rooting varieties of clover species and insect resistance.

1601 Camus, A.
Graminées hybrides de la flore française (genre *Bromus* excepté). [**Hybrid Gramineae of the French flora (the genus *Bromus* excepted)**].
Bull. Jard. bot. Brux. 1958 : **28** : 337–74.

Notes and bibliographical information are presented on intergeneric and interspecific hybrids of *Aegilops*, *Triticum*, *Agrostis*, *Calamagrostis*, *Agropyron*, *Elymus*, *Hordeum*, *Polypogon*, *Alopecurus*, *Ammophila*, *Avena*, *Brachypodium*, *Festuca*, *Echinochloa*, *Lolium*, *Glyceria*, *Phalaris*, *Poa*, *Puccinellia*, *Setaria*, *Spartina* and *Secale*.

1602 Hein, M. A.
Registration of varieties and strains of grasses.
Agron. J. 1958 : **50** : 685–86.

Descriptions are given of *Dactylis glomerata* 'Latar' [XXVIII, 573], *Agropyron intermedium* 'Greenar' [XXVII, 4097] and *A. inerme* 'Whitmar' [XXVII, 4099], recently registered in the USA.

1603 Tateoka, T.
Somatic chromosomes of *Leptaspis* and *Streptogyna* (Poaceae).
Nature, Lond. 1958 : **182** : 1619–20.

L. cochleata and *S. crinita* were both found to have a chromosome number of $2n = 24$. On the grounds of similarity in basic number ($x = 12$) and in some morphological and anatomical features, the genera represented by these two species are believed to be distantly related to the Bambuseae.

1604 Brown, W. V.
Apomixis as related to geographical distribution in the panicoid grass tribes.
J. S. Afr. Bot. 1958 : **24** : 191–200.

On the basis of the limited information at present available on the distribution of apomictic representatives of the panicoid tribes, the author suggests that apomicts occur most frequently at the centre of origin of an expanding tribe. Because of their low degree of variability, the apomictic taxa would remain in the original Old World habitats to which they were adapted and to which they would have become restricted. Sexual types, which in some cases might carry genes for apomixis, would constitute the majority of taxa at the periphery of the area occupied by a tribe and would give rise to new species in the more recently occupied regions. In an unchanging environment, however, the apomicts may have become extremely well-adapted in the centres of origin and undergone differentiation into a considerable number of species. In such an environment, the sexual diploid progenitors may either have been eliminated by the apomicts, or be restricted to small areas or share the geographical ranges of the apomicts. Attention is drawn to the significance of South Africa as an area where panicoid tribes are characterized by a high proportion of apomictic species [cf. XXVIII, 1732 and 4277].

1605 Veyret, Y.
Observations caryologiques chez quelques graminées tropicales. (**Caryological observations on some tropical grasses**).
J. Agric. trop. Bot. appl. 1958 : **5** : 308–10.

The following chromosome numbers were determined: *Streptogyna crinita*, $2n = 24$; *Danthoniopsis chevalieri*, $2n = 18$ and *Elytrophorus spicatus* $2n = 26$. Brief descriptions are included of the chromosomes of *S. crinita* and *E. spicatus*. In the case of *Oxytenanthera abyssinica*, it was not found possible to make an exact count of the chromosomes but the somatic number seemed to be about 60.

1606 Griffith, G.
Nitrate content of some grass species and strains.
Nature, Lond. 1958 : **182** : 1099–100.

Data are presented on total N, protein N and nitrate N in oven-dried material of ryegrass, fescue, cocksfoot, timothy and bent-grass species and strains grown under heavy nitrogen fertilizer application (1) in swards and (2) as spaced single plants. In type (2) material, *Lolium perenne* 'S23' and S143 cocksfoot are almost without exception considerably higher in nitrate than the remaining grasses, while in type (1), *L. perenne* 'S24' is higher than 'S23', and 'S143' is very much lower.

1607 MacLeod, A. M. & McCorquodale, H.
Trisaccharides of *Lolium* and *Festuca*.
Nature, Lond. 1958 : **182** : 815–16.

Further evidence for the close relationship between the above genera has been provided by the detection of a trisaccharide tentatively described as α-D-galactopyranosyl-3-α-D-glucopyranosyl-2-β-D-fructofuranoside in the seeds of all species of *Festuca* and *Lolium* investigated but not in other members of the Festuceae.

1608 Camus, A.
Espèces, sous-espèces et variétés nouvelles de Graminées malgaches. (**New species, subspecies and varieties of Madagascan Gramineae**).
Bull. Soc. bot. Fr. 1958 : **105** : 244–46.

The following new grasses are described: *Urelytum isalense*; *Cynodon transvaalensis* subsp. *poissonii*; *Danthoniopsis isalensis*; *Aristida decaryana* and *Panicum tsaratananense* var. *diffusum*.

1609 Camus, A.
Sur quelques *Panicoideae* de Madagascar. (**On some Panicoideae of Madagascar**).
Bull. Soc. bot. Fr. 1958 : **105** : 247–54.

Descriptions are provided of the following new species and varieties: *Setaria isalensis*; *Panicum pseudowoeltzkowii*; *P. pseudowoeltzkowii* var. *latifolium* and *P. danguyi* vars. *typicum* and *mahavavensis*.

1610 Bottazzi, G. B.
Foraggere arido-resistenti per territori a clima semi-arido. (**Drought-resistant forage crops for regions with a semi-arid climate**).
Genet. agr. 1957 : **8** : 1–9.

Initial clonal selection for drought resistance in experimental plots of *Dactylis glomerata*, *Festuca pratensis*, *Holcus* sp., *Hordeum bulbosum*, *Lolium italicum*, *Phalaris tuberosa*, *Phleum pratense* and *Trifolium pratense* is reported.

1611 Hunt, I. V.
Comparison of production from six strains of cocksfoot.
Res. Bull. W. Scot. agric. Coll. 1958 : No. 22 : Pp. 46.

A report is given of a comparison of Trifolium 1, Danish, Scotia, S26, S37 and S143 with respect to seasonal and total production at Auchincruive, west Scotland.

1612 McCollum, G. D.
Comparative studies of chromosome pairing in natural and induced tetraploid *Dactylis*.
Chromosoma 1958 : **9** : 571–605.

Four diploid subspecies, three diploid subspecific hybrids, the induced tetraploids of the seven diploids and several naturally-occurring tetraploids of the *D. glomerata* complex were studied at the University of California.

It was found that the mean numbers of quadrivalents per cell at meiosis in the natural and induced tetraploids were typical of autotetraploids. The variance analysis of quadrivalent frequencies showed that the differences between plants within strains and between strains within groups were highly significant but the differences between groups were not significant; the frequency of quadrivalents in the hybrid induced tetraploids was as high as that in the nonhybrid induced tetraploids. There was no evidence of preferential pairing to indicate structural differentiation of chromosomes between the diploid subspecies. In all the tetraploids examined, the frequencies within anthers of cells with 0, 1, 2, . . . 7 quadrivalents were distributed binomially, indicating that the probability of quadrivalent formation is the same for all the sets of homologous chromosomes. Only in plants of subsp. *hispanica* were the quadrivalent frequencies unusually low; this may indicate progress towards diploidization in a natural tetraploid.

Induced tetraploids had a slightly lower chiasma frequency and a higher frequency of trivalents and univalents at diacinesis and first metaphase than the corresponding frequencies of the natural tetraploids. Also the induced tetraploids had more unequal anaphase distribution, which probably results in the frequent production of aneuploid gametes and progeny.

Seed set in the induced tetraploids was significantly lower than that of the corresponding diploids and of some of the natural tetraploids.

1613 WASSOM, C. E. & KALTON, R. R.

Evaluation of combining ability in *Dactylis glomerata* L. IV. Randomness of pollination in topcross and polycross nurseries.

Agron. J. 1958 : **50** : 640–43.

"Separate replicate entries of seed from single plant replications in topcross and polycross nurseries of selected S_0 and S_1 clones of orchardgrass were evaluated in progeny tests for forage yield and panicle production. Variance ratios (F tests) of within-clone variance to error variance from analyses of variance provided information on the randomness of pollination in the seed source nurseries. Of the 21 such F tests for forage yield, only 1 was statistically significant, indicating random pollination for the most part. For panicle number, however, 6 out of 9 variance ratios were significant. This indicates genetic differences in the sample of male gametes from replication to replication in the outcross nurseries. Comparisons also were made of efficiencies of estimates of clonal means based on varying numbers of replications in topcross nurseries and progeny tests. Considering these results, growing only enough single plant replications in the topcross nursery (and mixing seed together on an equal weight basis from each replication) to provide sufficient seed for topcross progeny tests should be satisfactory for evaluating combining ability of orchardgrass clones." [Cf. XXVI, 455].

[Authors' summary].

1614 JOWETT, D.

Populations of *Agrostis* spp. tolerant of heavy metals.

Nature, Lond. 1958 : **182** : 816–17.

Populations of *A. tenuis* and *A. stolonifera* from sites contaminated by heavy metals showed a high degree of tolerance as determined from their root growth in solutions containing the respective metals, expressed as a percentage of their growth in nontoxic solutions. A lower degree of tolerance of metals not known to be present on the site was also generally shown by the resistant populations. Populations from normal sites showed little tolerance, the order of toxity found being copper > nickel > zinc > lead. It is thought that resistance may be due to the binding of the metal ions by a process analogous to chelation, but specific for individual metals.

1615 **New timothy strain released by Kentucky.**

Crops & Soils 1958 : **11** : No. **3** : 19–20.

Clair, developed at the Kentucky Agricultural Experiment Station, is vigorous, leafy and early maturing, with good aftermath production.

1616 THOMSON, J. R. & KEPPIE, J. L.

Spaced-plant trials at East Craigs. V. Strains of timothy, *Phleum pratense* L., and perennial ryegrass, *Lolium perenne* L., 1955.

J. Brit. Grassl. Soc. 1958 : **13** : 279–81.

At East Craigs, Edinburgh, Scotland, two strains of timothy from Sweden and two others from Denmark and Finland were compared with Scotch and the two Aberystwyth strains S48 and S51 as controls. The four foreign strains under trial are regarded as belonging to the group of early strains [cf. XXVI, 3392]. No statistically significant differences were found in growth habit and plant weight, the differences being slight in respect of stem length. These four strains were intermediate between Scotch and the Aberystwyth strains as regards aftermath shooting.

The Melle pasture strain of *L. perenne* from Belgium was compared with Irish, S23 and S101 as controls. Melle was found to be an extreme example of the group of late strains of perennial grass [cf. XXVI, 3398]; it started to shoot as much as 12 days later than S23. In growth habit Melle resembled S23 at the stage of ear emergence; it also produced significantly heavier plants than the control strains. Aftermath shooting was significantly less in S23 and Melle than in other strains.

1617 **Ryegrass licensed.**
Crops & Soils 1958 : **11** : No. 1 : 21–22.

A new winter-hardy variety of perennial ryegrass, Norlea, has been licensed in Canada. It is a leafy variety, rather later than the shorter types of ryegrass. The yield of forage and seed from Norlea is high, although it is moderately susceptible to leaf rust. Norlea will probably be useful in permanent and irrigated pastures and as a persistent and inexpensive turf grass.

1618 Desroches, R.
Le ray-grass italien "la meilleure et la pire" des graminées fourragères. (**Italian rye grass, "the best and the worst" of the forage grasses**).
Bull. Engrais 1958 : Suppl. : 16–21.

Brief notes are provided on two selections of *Lolium italicum* of the Marenne type. One of these, Rina, does not flower in the same year that it is established; this variety is noted for its longevity. Rita on the other hand does head in the same year that the seed is sown and rapidly produces a harvest.

Attempts being made to combine the good qualities of perennial and annual ryegrasses are mentioned. At Versailles, the variety Io is being multiplied; it is particularly winter hardy and can be relied on to perform well for a three-year period.

1619 Chestnutt, D. M. B.
Susceptibility of perennial ryegrass to blind seed disease (*Gloeotinia temulenta*).
J. Brit. Grassl. Soc. 1958 : **13** : 275–78.

A report is presented on the findings of the last three years of a six-year trial with eight strains of perennial ryegrass at Loughry Agricultural College, Cookstown, N. Ireland [cf. XXVI, 3402]. Irish Commercial and Devon Eaver were found to be the most resistant strains, S24 being the most susceptible.

1620 Griffiths, E.
Sexual reproduction and variation in *Gloeotinia temulenta* (Prill. & Delacr.) Wilson & Gray.
Trans. Brit. mycol. Soc. 1958 : **41** : 461–82.

Investigations at the Department of Agricultural Botany, University College of Wales, Aberystwyth, indicated that *G. temulenta* is obligately heterothallic and has two mating types. The results provided evidence that production of apothecia is entirely dependent on supply of microconidia, but the possibility of mating by hyphal fusion cannot be precluded. Variation, assessed on the basis of cultural characters, is very considerable, being comparable with that found in such fungi as *Venturia inaequalis* and *Ustilago maydis*. Mycelial *v.* conidial growth was under the control of more than one pair of alleles and markedly affected by the substrate. Study of 50 isolates revealed no differences in nutritional requirements; all were dependent on biotin and partially dependent on aneurin.

1621 Carpenter, J. A.
Production and use of seed in seashore Paspalum.
J. Aust. Inst. agric. Sci. 1958 : **24** : 252–56.

The extremely low seed production of a South African clone of the salt-tolerant species *P. vaginatum* is a serious disadvantage in the establishment of the grass on summer-moist, saline seepages in Western Australia. This sterility has been found to be due to self incompatibility. This clone, two from the south coast of Western Australia and a fourth from Queensland were fully cross fertile in all combinations. Of the three Australian clones, only the one from Queensland was appreciably self fertile. In the field, seed production as the result of open pollination in swards of mixed clones was abundant.

1622 Baltensperger, A. A.
Variability in reed canarygrass, *Phalaris arundinacea* L.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–2178 : p. 1930. (Abst.).

Among 27 seed accessions, those selected for apparent resistance to shattering generally yielded more seed than those from commercial seed lots. In comparisons with three synthetic generations of Ioreed, most accessions yielded more forage and all were higher in seed production. In spaced plantings of 39 seed accessions and three clones, highly significant differences were obtained among accessions for autumn vigour and greenness, winter injury, aftermath vigour, hay vigour, flowering date and leafiness, many of the accessions being better than Ioreed. Estimates of genotypic variation were 73, 66, 48 and 26% for leafiness, leaf width, flowering date and hay vigour, respectively, indicating that genetic advance in the first three characters may be effected by phenotypic selection in spaced plantings. The low correlations occurring between vigour in the spaced plantings and yields in the close stands suggest that improvement of yield in close stands cannot readily be effected by selection in spaced plantings. Inherent differences in shattering were found.

1623 Baltensperger, A. A. & Kalton, R. R.
Variability in reed canarygrass, *Phalaris arundinacea* L. I. Agronomic characteristics.
Agron. J. 1958 : **50** : 659–63.

Seed accessions of *Ph. arundinacea*, mainly from the north central region of the USA, were tested for forage yield in broadcast sowings in Iowa. Differences among the entries were larger when the species was grown alone than with Ladino clover. Several accessions were consistently above Ioreed synthetics 2, 3 and 4. In tests of seed yield in drilled-row plots, many entries were significantly better than the Ioreed synthetics. Scores for relative panicle production and actual counts of panicles both gave reliable predictions of seed yield. The bulk head selections included in the tests had been selected for resistance to shattering and as a group averaged higher in seed yield than the commercial seed lots and Ioreed synthetics which constituted the other material under test. The interaction entry x location for seed yield was not significant. Seed accessions, Ioreed synthetics and three clones were studied in a space-planted nursery with respect to several characters. Significant disparities among the accessions were found in autumn vigour and greenness, winter injury, aftermath vigour, hay vigour (scored according to vegetative growth), date of flowering, leaf width and leafiness percentage (calculated from ratio of dry weight of leaf blades to total dry weight in a random sample of five panicled culms). Estimates of genotypic variation for leafiness, leaf width, date of flowering and hay vigour were respectively 73, 66, 48 and 26%. The genotypic correlation between leafiness percentage and leaf width was low ($r = 0{\cdot}15$). Leafiness percentage and hay vigour were associated ($r = 0{\cdot}58$). Since 17 entries were common to the forage-yield tests and spaced nursery, comparison of performance in the two types of tests was possible. Correlations of vigour scores in the spaced nursery and yields in the broadcast plantings were in all cases low and lacking in significance.

1624 Cotte, A.
Les sorghos fourragers. **(Forage sorghums).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 337–48.

At Montpellier, the forage production of about 20 varieties of *Sorghum saccharatum* and *S. bicolor* originating from several countries was studied. The varieties were classified according to earliness, and various characters affecting yield were investigated. Considerable variation in tillering capacity was noted; early varieties of *S. saccharatum* such as Amber and Rancher were most outstanding in this respect. Tillering seemed to be less important in determining yield than the size of the stems and quantity of leaf produced. In general the later varieties produced the tallest and stoutest stems and also the largest and greatest number of leaves. Forage from late or semi-late varieties seemed to have a higher dry matter content than that from earlier varieties, comparisons being made at similar stages of development. However some mid-season varieties such as Rox Orange equalled the later varieties in dry matter content. A high proportion of sugar was found in the dry matter content of these sorghums. Varieties of *S. saccharatum* and in particular the earlier types produced most seed as shown by a varietal trial in 1949. Some of the early sorghums suffered from lodging.

Sorgho sucré de la Drôme, lignée 13 [La Drôme sweet sorghum, line 13] and Rox Orange are being multiplied. The former was selected from a population of *S. saccharatum* originating from the USA; the introduced variety may have been Sorgho sucré hâtif du Minnesota [Early Minnesota sweet sorghum]. Line 13 has stems growing to a height of 170–230 cm., abundant foliage and satisfactory tillering. The 1000-grain weight is 18–20 g.; this medium early variety gives a good yield of grain but the stem has a low sugar content (6–12%). Rox Orange comes from the Orange group of varieties, also from the USA. It is more resistant to lodging than Sorgho sucré de la Drôme and produces longer stems, more foliage and fewer tillers. Rox Orange has a 1000-grain weight of 20–23 g. and the stems contain 15–18% of sugar. This variety is later than the former and gives a higher yield of green forage and dry matter but a lower yield of grain.

Varieties of *S. sudanense* from various countries were also tested; the American variety Sweet Sudan with stems of high sugar content is being multiplied in France.

1625 Taranenko, V. I.
(Hydrocyanic acid and sugar in sorghum).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 4 : 25–28. [Russian].

The contents of HCN and sugar in five varieties during a full cycle of development under the conditions of the Ukrainian steppe zone were investigated and data showing varietal differences in these respects are presented. All varieties as they ripened showed a reduction in HCN and an increase in sugar and none were toxic to cattle at the stage of waxy ripeness of the grain. Hybrid 698 bred at the Maize Institute had the lowest HCN content.

LEGUMINOUS FORAGE PLANTS

1626 HUDSON, P. S.
Fodder plants.
Nature, Lond. 1958 : **182** : 702–03.

A symposium on fodder plants, organized by the Institute of Plant Breeding of the Polish Academy of Sciences and held at Poznań during 25–27 June, 1958, was concerned largely with lupins and included the following contributions. E. Nowacki reported that the classification of the genera of the Genisteae on the basis of alkaloid composition corresponds with the morphological classification, and that a similar classification applied to species within the genus *Lupinus* leads to a grouping corresponding to differences in composition of anthocyanins, flavones, proteins and fats and to differences in chromosome number where these exist. Segregates of the triple hybrid (*L. ornatus* x *L. mutabilis*) x *L. douglasii* are distinguished by high yield and earliness. A. Hagberg reviewed the use of polyploidy in breeding in Sweden. Soviet work on sweet lupins, reported by N. A. Majsurjan, included the development of a promising form from *L. angustifolius* x *L. linifolius*, which combines the small seeds of the latter parent with a plant type similar to that of the former, together with earliness and low alkaloid content. Evidence was presented supporting the view that *L. mutabilis*, which crosses readily with the small-seeded American species such as *L. ornatus*, is itself a hybrid. H.-J. Troll spoke on the development of sweet nonshattering forms of *L. luteus* and *L. angustifolius* which ripen uniformly. J. Hackbarth mentioned mutants showing vigorous growth and others with a thermoneutral developmental reaction. W. Plarre described methods of detecting the thermoneutral condition by vernalization and referred to a hybrid of this type which is being released in Eastern Germany.

N. Clark gave an account of the work leading to the production of the synthetic lucerne Vernal [cf. XXIII, 2008], and E. Åkerberg described Swedish breeding achievements in clovers and lucerne. R. Focke and others reported that tetraploid red clovers, although higher than diploids in fodder yield, were lower in fertility. Tetraploid red clovers with 20% fertility were mentioned by H. Kress, who also reported 89% fertility obtained in tetraploid white clover after selection for short corolla tube.

1627 BÖJTÖS, Z.
A lucernanemesítés időszerű kérdései. **(Current problems in lucerne breeding).**
Magyar Mezőgazdaság, Budapest 1958 : No. 1 : 14–15 [from Hungar. agric. Rev. 1958 : **7** : No. 3 : p. 2.] (Abst.).

Polycross breeding and intervarietal hybridization have been in use at Hungarian breeding stations since 1950 and the first synthetic and varietal hybrids have now been included in the state trials. Work on the production of double-cross F_1 hybrid seed has begun.

1628 DEMARLY, Y.
Principaux aspects de la sélection des luzernes à la Station Centrale d'Amélioration des Plantes de Versailles. **(The principal features of lucerne breeding at the Central Plant Breeding Station of Versailles).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 273–86.

Breeding of lucerne at Versailles is primarily concerned with the improvement of forage types. Attempts are being made to produce a high yielding, early variety which is homogeneous for flowering date and equal or superior to the Flemish type in resistance to cold and diseases.

Plants showing desirable characters are selected and inbred; in this way, use is said to be made of dominant major genes and some polygenic factors. The most vigorous families are retained and when these are considered to be sufficiently homogeneous, they are used to produce a large number of hybrids. In this way, those plants with the best specific combining ability are detected. The yielding capacity of the hybrids is tested using only small numbers of individuals. The best hybrids are then multiplied and further selected. By this procedure 12–15 years are required for developing a new variety. Preliminary results indicate that noteworthy increases in yield may be obtained in this way.

1629 GRICENKO, T. G.
(The breeding and seed production of lucerne, maize, sorghum and other forage and grain crops).
Bjull. naučn.-teh. Inform. Sojuz NIHI (Bull. sci.-tec. Inform. All-Un. Cott. sci.-res. Inst.) 1957 : No. 2 : 14–15. [Russian].

Breeding work with lucerne is briefly referred to. The results are some new varieties with improved yields, in particular Taškent 1, 721 and 3192. Several other lucerne varieties obtained by hybridization between varieties differing in photoperiodic requirements have reached an advanced trial stage.

1630 Brown, B. A.

Alfalfa variety trials, 1947-1957.

Bull. Conn. (Storrs) agric. Exp. Sta. 1957 : No. 335 : Pp. 22.

The results of three five-year tests at Storrs, Conn., are reported. The number of varieties and strains in each test ranged from 14 to 30. The trials demonstrated that the bacterial-wilt resistant varieties Buffalo and Ranger maintained their stands and yields beyond the third harvest year much better than susceptible varieties which are more readily established, such as du Puits and Narragansett. In the last five-year test, nearly all of 16 unnamed strains showed less wilt infection, maintained their stands longer and yielded more than any of the named varieties.

1631 Andrew, W. D. & Kirchner, R.

Inherent variability in barrel medic *Medicago tribuloides* Desr.

J. Aust. Inst. agric. Sci. 1958 : **24** : p. 259.

A note is given reporting that no segregation has been evident in 40 naturalized strains grown for at least two generations at Canberra, whereas 12 of the 20 lines introduced from the Mediterranean region of Europe have shown marked segregation for various characters during the first and second year of trial. These observations imply self pollination and homozygosity in the local strains and heterozygosity in over half of the introductions as a result of cross pollination in their natural habitats. It is therefore suggested that much of the variability existing within the species in Australia arose before introduction.

1632 Hanson, C. H.

Registration of varieties and strains of alfalfa, IV.

Agron. J. 1958 : **50** : 684–85.

Information is provided on the origin and characteristics of four lucerne varieties recently registered in the USA: Atlantic [XV, 645 and XVI, 795], Caliverde [XXII, 1215 and XXIV, 1142], Lahontan [XXV, 330 and XXVIII, 603] and Williamsburg [cf. XVIII, 255].

1633 Adams, M. W. & Semeniuk, G.

Teton alfalfa, a new multi-purpose variety for South Dakota.

Bull. S. Dak. agric. Exp. Sta. 1958 : No. 469 : Pp. 8.

Suitable for hay, grazing or seed in South Dakota, Teton is the result of an initial cross made in 1914 between an introduction of *Medicago sativa* from Taškent and a strain of *M. falcata* from Siberia, followed by natural selection up to 1949, in which year the first artificial selections were made. After two generations of intercrossing and progeny testing, four selections were retained as the basis of the new variety. Teton is highly resistant to winter conditions, frost in late spring or early autumn, *Pseudopeziza medicaginis*, *Fusarium oxysporum* and *F. roseum* (*Gibberella zeae*). Equal to Ladak and Vernal in yield from the first cutting, it is moderately dormant after cutting and in the autumn. In persistence under grazing conditions, Teton has surpassed all other varieties tested.

1634 Stanford, E. H. & Clement, W. M.

Cytology and crossing behavior of a haploid alfalfa plant.

Agron. J. 1958 : **50** : 589–92.

Information on this plant has already been published [cf. XXVI, 1054], a more complete account being now presented. Meiosis is fairly regular in the haploid but one quadrivalent is formed, a reciprocal translocation having occurred. Reduced gametes are rarely functional but polyploid gametes are frequent and viable. In a cross between the haploid and a tetraploid, the progeny were most frequently tetraploid or pentaploid.

The good pairing observed at metaphase is thought to indicate that common lucerne is an autotetraploid in which the chromosome sets do not differ markedly.

1635 Sahni, V. M.

Genetics of self-incompatibility in alfalfa.

Diss. Abstr. 1958 : **18** : Publ. No. 22,295 : 1933–34. (Abst.).

Crosses were effected between the diploid *M. sativa* plants 4454 and 4459, both highly self sterile but reciprocally cross compatible. The progenies were self incompatible. Intercrosses in the F_1 gave a distribution highly skewed towards low cross compatibility, thought to be due to increased homozygosity and loss in vigour accompanying increased inbreeding. On the basis of data from selfing, back crossing and intercrossing the F_1 plants, it is suggested that the incompatibility system involves: (1) at least two loci with multiple alleles and a definite epistatic relationship between the two allelic series; (2) a pollen incompatibility reaction under sporophytic control, so that all pollen grains from one plant behave alike; (3) dominance only in the anther; and (4) individual action in the style.

1636 SCHONHORST, M. H.
The inheritance of viable pollen in alfalfa.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1812 : p. 1934. (Abst.).

Pollen fertility was studied in the S_0 clones and S_1, F_1, F_2 and back-cross progenies from selfings and crosses of diploid *Medicago falcata* plants with (*a*) 95% viable pollen and (*b*) 25–30% viable pollen. Reciprocal differences were not detected in the crosses. Mean values of S_0 and F_1 parents were highly correlated with their progeny means, indicating that selection for high or low pollen viability would be effective. Combined data on the distribution of pollen viability in the inbred and hybrid progenies suggested a trimodal distribution with low points at 30 and 50% aborted pollen. It is thought that at least three genes, *A*, *B* and *C*, are involved. Gene *A* is dominant and environmentally stable and results in 0–30% aborted pollen. Genes *B* and *C* are additive in effect, together equalling *A* and individually producing 31–50% pollen sterility; *B* is more stable against environment than *C* but less so than *A*. The homozygous recessives of all three genes are more than 50% pollen sterile and are the most sensitive to environmental changes. Pollen abortion is not related to ovule abortion, meiotic irregularities or plant vigour.

1637 DEMARLY, Y.
Biologie et exploitation de la luzerne. (**The biology and utilization of lucerne**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 247–72.

The distinguishing morphological characters of some French populations and varieties of lucerne are mentioned; the resistance of these lucernes to cold and important pathogens is also noted. Different ways of cultivating and exploiting lucerne are discussed in relation to its vegetative cycle.

1638 CROWDER, L. V. & BAIRD, G. B.
Response of alfalfa varieties to boron application.
Agron. J. 1958 : **50** : 569–70.

The response of five lucerne varieties to boron application was studied at the Palmira Experiment Station, Colombia; significant varietal differences were noted.

1639 GLADKOV, S. A.
(A valuable lucerne variety for the southern Ukraine).
Selekcija i Semenovodstvo (Breeding & seed-growing) 1958 : No. **3** : 46–48. [Russian].

Herson 1 was obtained by intercrossing selected families of populations 207 and 229, both originating from the province of Poltava. It is winter hardy, resistant to drought and fungi and outyields Zajkevič under Herson conditions.

1640 KOHEL, R.
See higher yields in winter-hardy alfalfa.
Crops & Soils 1958 : **11** : No. 1 : p. 32.

At Purdue University, studies are being carried out on the genetic relationship between autumn dormancy and cold resistance in lucerne. Progeny from crosses between winter-hardy and non-winter-hardy parents were intermediate between the parents in respect of autumn dormancy but were sufficiently hardy to survive the winter of 1957. It is hoped that a winter-hardy variety with the productivity and rapid recovery of non-winter-hardy types will be produced.

1641 FULKERSON, J. F.
Differential response of alfalfa clones to variant forms of *Corynebacterium insidiosum*.
Phytopathology 1958 : **48** : p. 461. (Abst.).

Clones of the bacterial-wilt susceptible lucerne du Puits were tested for reaction to a wild-type isolate, using root-inoculation techniques. After two such tests, four clones were chosen, each having a known degree of susceptibility to the wild-type isolate. In comparative tests, one clone was significantly more susceptible to a culture variant of the wild type than to the wild type. The remaining three clones were equally susceptible to both isolates. The variant was indistinguishable in culture from isolates obtained from naturally-infected field-grown plants.

1642 ADAMS, M. W. & SEMENIUK, G.
The heritability of reaction in alfalfa to common leafspot.
Agron. J. 1958 : **50** : 677–79.

Data on reaction to natural infection with leaf spot (*Pseudopeziza medicaginis*) were taken from two nurseries established at Brookings, S. Dak. The first consisted of clonal, selfed and diallel-cross progenies of nine plants, the second of clonal progenies of 24 root-proliferating plants, together with the offspring from controlled intercrosses of each of these 24 plants. Estimates of heritability of family differences ranged from 79·26 to 89·62%, suggesting the preponderant influence of genes with additive effect. The heritability of individual-plant differences, based on data from the first nursery, was calculated as 27·4%. The discovery of such a high level of additive genetic control of family differences leads to three suggestions. (1) Progress in breeding for resistance may be readily expected, provided sufficient genetic variance exists in the initial material. (2) Selection on the basis of family means, or mass selection in a replicated clonal nursery, should be satisfactory. (3) If leaf-spot reaction is governed by a small number of genes, efficient selection might result in a rapid depletion of the genetic variance, perhaps in a single generation.

1643 Spickschen, G.
Beiträge zur Kenntnis der französischen Luzerne. (**Contributions to the knowledge of French lucerne**).
Forschung und Beratung 1957 : No. **6** : 39–42.

Well known varieties of lucerne from several countries together with French provenance types were tested at Vluyn, Niederrhein. The lucerne from northern France gave the highest yield. The lowest crude protein contents were found in this lucerne and the French cultivated varieties; these lucernes had the highest dry matter contents. A positive correlation was found between profuse branching and yielding capacity. The lucerne from northern France had the lowest ratio of leaf to stem; those from Italy and Provence produced the highest proportions of leaf. French cultivated varieties were the most winter hardy but German varieties and the French types were also quite hardy. As regards attack by *Pseudopeziza medicaginis*, the lucerne from northern France, French cultivated varieties and Binsheimer Sandluzerne [Binsheim sand lucerne] showed no sign of disease.

1644 **Choose right variety for dehydrated alfalfa.**
Crops & Soils 1958 : **11** : No. 1 : p. 21.

Leaf spot and other diseases reduce the nutrient content of lucerne. The California Common variety after a heavy attack by leaf spot, had 12·9% protein and 96 p.p.m. of carotene at harvest; the resistant variety Caliverde had 18·4% protein and 204 p.p.m. of carotene under the same conditions.

1645 Medler, J. T.
Seed production and certain growth characteristics of insect-free alfalfa.
J. econ. Ent. 1958 : **51** : 729–33.

Twenty-eight clones, mostly of Cossack origin, were studied for two years at Madison, Wis., with and without control of sucking insects, such as *Lygus lineolaris*, *Adelphocoris lineolatus* and *Empoasca fabae*. The clones differed inherently with respect to good, medium or poor production of seed, although seed-producing ability was predominantly influenced by environmental factors. The interclonal variation could be explained in relation to the pod count on the flower rachis, with or without insect control. It is concluded that insecticidal protection against sucking insects should be provided if inherent characters of plant growth and seed production are to be correctly evaluated.

1646 Morton, G.
Developing new alfalfa varieties.
Report, Lafayette, Ind. 1958 : **1** : No. **1** : 3–5.

This popular article outlines the aims and methods of lucerne breeding at Purdue University, Ind. Mention is made of an experimental variety, A–600, with improved resistance to cuckoo spit (*Philaenus leucophthalmus*), potato leafhopper and spotted aphid, chiefly as the result of increased tolerance. Preliminary trials have shown A–600 to possess more resistance to aphid than any other lucerne grown in the Midwest. The variety has favourable agronomic characteristics.

1647 Dessureaux, L. & Oulette, G.-J.
Sélection de la luzerne pour tolérance à la toxicité du manganèse. (**Selection of lucerne for tolerance of manganese toxicity**).
Ann. ACFAS 1957 : **23** : p. 77. (Abst.).

Clones, varieties and hybrids tested at the Experimental Station at Sainte-Anne-de-la Pocatière, Quebec, reacted differently to nutrient solutions containing an excess of manganese. It is thought that tolerance depends on the rate at which manganese is translocated from the roots, where it is harmless, to the leaves where it has a toxic effect.

1648 Litvinenko, F. P.
(**Selection in the breeding of perennial forage plants**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. **3** : 19–22. [Russian].

The writer disagrees with the views expressed by many Soviet agrobiologists that the selection of useful components from a population inevitably gives biologically unbalanced and economically less valuable material. He mentions new high-yielding clover populations (species not stated) built up from winter-hardy or drought-resistant plants selected from the Ukrainian population Tolmačskij.

1649 Kilpatrick, R. A.
Curvularia leaf blight of clovers and its causal agent, *Curvularia trifolii.*
Phytopathology 1958 : **48** : 513–15.

In tests of white clovers, 0·2% of inoculated seedlings proved resistant to *C. trifolii*, seedlings from the Oregon selection FC33144 being the most resistant. Among nine red clover varieties, 2% of the seedlings were resistant, Thomas being the best. *Trifolium ambiguum*, *T. carolinianum*, *T. filiforme*, *T. fragiferum*, *T. hirtum* and *T. semipilosum* were all resistant, while the numerous other varieties tested were intermediate or susceptible. Intraspecific differences in reaction were also observed.

1650 Demidenko, G. B.
(A description of cultivation of perennial forage plants in the Orel province).
Zemledelie (Agriculture) 1958 : No. **3** : 42–47. [Russian].

Mention is made of the red clovers Bolhovskij Mestnyj [Local Bolhov] and Šatilovo, both late-developing land races of good overwintering ability. They outyield all early varieties in the province of Orel.

1651 Hollowell, E. A.
Registration of varieties and strains of red clover, IV.
Agron. J. 1958 : **50** : p. 692.

Chesapeake, recently registered in the USA [XXVIII, 4335], is described.

1652 Smaragdova, N. P.
(Morphological and physiological rapprochement between the honey bee and red clover).
Agrobiologija (Agrobiology) 1958 : No. 2 : 37–41. [Russian].

Parallel experiments on breeding red clover for a short corolla tube and bee for a long proboscis are reported from Moscow. Productive forms of *Trifolium expansum* having short corolla tubes have been selected.

1653 Van Bogaert, G.
La présence de gousses à plusieurs graines dans le trèfle rouge. **(The presence of pods with several seeds in red clover).**
Rev. Agric., Brux. 1958 : **11** : 947–55.

The occurrence of two seeds in a pod seemed to be genetically determined in a complex manner.

1654 Puia, I., Goisan, N. & Drăgan, V.
Perioada critică şi rezistenţa la secetă a trifoliului roşu de transilvania (*Trifolium pratense* L.). **(The critical period and resistance to drought of red clover (*T. pratense* L.) from Transylvania).**
Stud. Cercet. Agron., Cluj. 1957 : **8** : 227–40.

These investigations included pot experiments to determine the relative drought resistance of a series of Transylvanian types. None of the samples showed much resistance, though Nuşeni III, Sîntămăria-Orlea and Bărăşti-Haţeg were superior to the others.

1655 Kolp, B. J.
The inheritance of resistance to powdery mildew *Erysiphe polygoni* DC. in red clover *Trifolium pratense* L.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2659 : 200–01. (Abst.).

Data from crosses of resistant plants with resistant, moderately susceptible and highly susceptible individuals led to the hypothesis that three loci, *A*, *B* and *C*, were responsible for reaction to *E. polygoni*. Gene *B* was dominant for susceptibility and was inhibited by *A*, which was dominant for resistance. The third gene, *C*, situated 20 cross-over units from *A*, was dominant for susceptibility and inhibited the action of *A*. No linkage was detected between genes for mildew reaction and *S*, for incompatibility or the genes for leaf marking. Recurrent selection for resistant plants would be effective in selecting against *C* but would not eliminate *B* or *a*. By introducing a *ccaaBB* tester (susceptible) in the programme of recurrent selection, clones homozygous for *A* could be identified. Crosses with a *ccaabb* tester (resistant) would reveal the presence of *B*.

1656 Athow, K. L. & Davis, R. L.
Inheritance of resistance to southern anthracnose in red clover.
Phytopathology 1958 : **48** : 437–38.

In a cross between a resistant selection (Res. 7–1) and a susceptible selection (Sus. 5), resistance to southern anthracnose (*Colletotrichum trifolii*) was controlled by a single recessive gene.

1657 Zwingli, W. & Grundbacher, F.
Weisskleeversuch mit einigen bekannten Zuchtsorten. **(A white clover trial with some well-known cultivars).**
Mitt. schweiz. Landw. Zürich-Oerlikon 1958 : **6** : 155–59.

The results are reported of a four-year trial held in Rossberg, Switzerland, with nine white clovers and a local type of *Trifolium pratense*. The German variety Gigant was the most productive.

1658 Hollowell, E. A.
Registration of varieties and strains of white clover (*T. repens*).
Agron. J. 1958 : **50** : p. 692.

Recently registered in the USA, the synthetic variety Louisiana S1 is described [XXIV, 3080].

1659 Kress, H. & Fuchs, A.
Ein Beitrag zur Selbstfertilität beim Weissklee. I. Mitteilung. **(A contribution on self fertility in white clover. I.).**
Züchter 1958 : **28** : 268–75.

Self-fertile forms were selected from a Latvian population of *Trifolium repens* well adapted to conditions in northern Germany; five inbred generations were studied. Considerable variation in seed yield from year to year was observed in the self-fertile forms, this being comparable to the variation found in cross-pollinated populations. Seed yield is greatly influenced by weather conditions; weather which favours the development of vegetative organs is unfavourable to seed production. However strains showed genetically determined differences in self fertility which were independent of the weather conditions. For example race 15 showed good fertility in four different years, whilst races 2 and 6 gave poor results in the same years. It therefore seems to be possible to improve the self fertility of *T. repens* by breeding methods.

1660 Yamada, T. & Sakakura, Y.
(Studies on the drought resistance of Ladino clover. III. On the influence of drought upon stolonation, development of nodes and rooting, with special reference to intertypic differences).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 121–22. [Japanese].

Two 8*x* strains were studied, a form with abundant foliage and a form with sparse foliage [cf. XXVIII, 4344]. Under conditions of drought, marked reduction in number of stolons, number of nodes and number of rooting nodes occurs. Significant differences between the two strains in these three respects were noted.

1661 Brewbaker, J. L.
Self-compatibility in tetraploid strains of *Trifolium hybridum*.
Hereditas, Lund 1958 : **44** : 547–53.

A detailed account is given of investigations which have already been briefly reported elsewhere [XXVIII, 1305].

1662 Morley, F. H. W.
The inheritance and ecological significance of seed dormancy in subterranean clover (*Trifolium subterraneum* L.).
Aust. J. biol. Sci. 1958 : **2** : 261–74.

It has been shown that seed dormancy is at least partially dependent on the genotype of the embryo, as distinct from that of the testa, and that the degree of dormancy is highly heritable, with a tendency for high dormancy to be dominant.

In a series of germination tests at 20° to 22° C., using strains from the Mediterranean region, dormancy tended to be greater in strains from cool climates than in strains from warmer climates.

1663 Frankel, O. H. & Williams, J. D.
A record of natural crossing in subterranean clover.
J. Aust. Inst. agric. Sci. 1958 : **24** : 162–63.

Single plants of the F_4 generation of Yarloop x Burnerang were interplanted with a strain with red leaves, determined by a single dominant gene. Two seedlings out of over 1000 obtained showed the red leaf character, indicating that cross pollination had occurred. It is not known whether the partial male sterility of the green-leafed strain had any influence on the result of this test.

1664 **How we got a new crimson clover.**
Agric. Res., Wash. 1958 : **7** : No. 4 : p. **11.**

Selected at the Mississippi Agricultural Experiment Station, the crimson clover Chief has the advantages of hard seed, volunteering and lateness of spring growth.

1665 Buttenschön, H.
Genetisch-züchterische Untersuchungen an *Trifolium resupinatum* unter Berücksichtigung der genetischen Ursachen der Selbststerilität. **(Investigations on the genetics and breeding of *T. resupinatum* with regard to the genetical causes of self sterility).**
Z. Pflanzenz. 1958 : **40** : 225–61.

At the Technical High School, Hannover, seven Iranian strains of *T. resupinatum* and two others from Portugal and America were investigated. Six of the Iranian populations and the Portuguese strain were late-shooting types forming rosettes; the other Iranian population was an early type and the American strain represented the wild form of *T. resupinatum*. These differences between the populations were found to be independent of the cultural conditions.

None of these strains proved to be particularly promising for intensive fodder cultivation in central Europe. Only the late-shooting forms gave yields of green fodder worthy of mention, under the particularly favourable conditions of the experiment.

An abundance of flowers was observed on *T. resupinatum* but the yield of seed was rarely satisfactory, seed set being greatly influenced by the weather conditions occurring during the time of flowering. Rain at this time sometimes prevented any seed being set at all. Damp warm weather during the time of seed ripening resulted in much sprouting even in seeds which were not completely ripe. Capacity for regeneration was particularly low in the early-shooting type, being rather better in the later types.

All the populations showed resistance in the seedling stage to late frosts occurring during the period 1955 to 1957. However susceptibility increased with development, considerable damage occurring at a temperature of — 4° C. during the time of flowering. Only the late-shooting types showed some winter hardiness whilst in the rosette stage of development.

From three populations, élite plants were selected which had properties desirable in fodder plants. Progenies obtained by open pollination from élite plants of the early type did not differ essentially in their external appearance from plants of the original populations; also their variability was not markedly lower. The original population must have been extremely heterozygous. No plants showing great promise in respect of vegetative development or seed production were found amongst these progenies. Further breeding with these selections was not considered to be worthwhile. Testing progenies from élite plants of two late populations was made difficult by the low seed set, only a few plants being available. These progenies also showed great variation; it was therefore not possible to make a reliable evaluation of the élite strains. Attempts to reproduce élite plants vegetatively were not successful; the cuttings began to flower after very little vegetative development had occurred so that no plants suitable for breeding purposes were produced.

Crosses were effected between two of the late Iranian strains on the one hand and the early population on the other. Neither in the F_1 nor in the F_2 generations were there any new combinations of useful characters; it was apparently not possible to achieve the desirable combination of high productivity in green forage with early shoot development. The growth characters of the hybrids were intermediate between those of the parent forms. Early-shooting hybrids were inferior to the later types in vegetative development. Hybrids and parents were equally susceptible to *Fusarium*. F_1 hybrids between the American and Iranian types were also intermediate with respect to shooting and flowering times.

T. resupinatum is self sterile; no cases of self fertility were found during these investigations. Diallel crosses were effected with 15 F_1 plants from a cross between two Iranian populations; amongst these F_1 plants, four intrasterile-interfertile groups were determined. Within the groups no differences were found between reciprocal crosses in respect of fertility. The results indicated gametophytic control of sterility by the pollen with each parent having two different sterility alleles, none of these being common to both parents. Diallel crosses were also carried out with the F_2 progenies; the results confirmed the conclusions drawn from the F_1 results. Differences in seed set were independent of the sterility alleles of the pollen parent.

1666 Bhaskaran, S. & Swaminathan, M. S.
Polyploidy and the genesis of the leguminous root nodule.
Nucleus, Calcutta 1958 : **1** : No. 1 : 75–88.

Studies of diploids and tetraploids of *Trifolium alexandrinum* and *Melilotus indica* revealed that the chromosome number in infected nodular cells was in each case usually twice that of uninfected cells of the same plant. In a few peripheral cells of the nodules, the normal somatic number of chromosomes was observed, whilst some central cells had four times the somatic number. Various mitotic aberrations were observed in nodule cells. Tetraploid *T. alexandrinum* had more nodules per plant than the corresponding diploid, although the number of nodules per unit length of tap root was about the same. Nodule development as shown by the dry weight was better in the tetraploid. In *M. indica* the tetraploid was not superior to the diploid in either the number of nodules produced or their development.

It is thought unlikely that only disomatic cells are infected; such cells occur only rarely in uninfected roots of the species studied. Diploid cells are probably also infected, becoming polyploid subsequently as a result of the infection.

1667 **"Warrior", improved vetch variety developed at API.**
Seed & Gdn. Merch. 1958 : **21** : No. 9 : 35–36.

This variety, developed at the Agricultural Experiment Station of Alabama Polytechnic Institute, gives a high yield of green matter equalling that of hairy vetch or Williamette, except in unusually cold winters in northern Alabama. In seed production, Warrior averaged 1,009 pounds per acre at Auburn in small plot tests, whereas hairy gave 195 pounds and Williamette 177 pounds; Warrior's seed, which may be harvested in late May or June, is of high quality. This variety is suitable for winter grazing and may be grown successfully with Abruzzi rye or adapted varieties of wheat and oats; it is stated that Warrior has provided earlier grazing than any other winter annual legume tested.

1668 Hartschaligkeit bei Winterwicken. (**Hard seeds in winter vetches**).
Mitt. dtsch. LandwGes. 1958 : **73** : 862–64.

Specific and varietal differences in the incidence of this character are mentioned for some vetches studied at Weihenstephan, Germany.

1669 Ilchievici, C. & Varga, P.
Contribuţii la ameliorarea sparcetei. (**Contributions towards the improvement of sainfoin**).
Bul. şti. : Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 205–11.

Trials of local and introduced strains have shown that local Rumanian strains from Cîmpia Turzii and Valu Traian and an introduced Russian strain were most productive of green matter. Higher yields still were obtained from hybrid 6, obtained by open pollination in a sainfoin varietal collection at Bucureşti.

1670 Hollowell, E. A.
Registration of varieties and strains of Lespedezas, II.
Agron. J. 1958 : **50** : p. 693.

Lespedeza stipulacea 'Climax', recently registered in the USA, is described [XVIII, 1350].

1671 **Israel annual sweetclover top yielder in Kentucky.**
Crops & Soils 1958 : **11** : No. 1 : p. 21.

In recent tests held in Kentucky, Israel produced slightly more than two tons of forage per acre. It had finer stems and more leaves than the other varieties; it also remained green for a longer time. Southland and Achenbach brome grass also gave high yields of forage and a selection of timothy, G3–80, was superior to three commercial varieties.

1672 Schlosser, G.
Über Untersuchungen an Zuchtmaterial von cumarinarmem ("süssem") Steinklee (*Melilotus*). [**Investigations on breeding material of sweet clover (*Melilotus*) of low coumarin content**].
Züchter 1958 : **28** : 217–23.

Considerable success has been attained in breeding sweet forms of *M. alba* by repeated selection for low coumarin content in material originating from a cross of *M. alba* x *M. dentata*. The fluorometric method used to determine coumarin content qualitatively and quantitatively at Gülzow-Güstrow is described. Since coumarin content varies during the development of a leaf, only the youngest leaves are tested. Details are provided of work carried out during 1955 and 1956 in which bulk-collected seed from sweet plants was grown, the resulting plants being tested and further selected. The plants from the 1956 crop were generally better than those of 1955 as regards their low coumarin content and differed only slightly from *M. dentata* in this respect. A fair number of plants were variable in their coumarin content; for example in one test they might be found sweet and in the next test slightly bitter, later reverting to sweet again.
Extensive yield trials are now planned for the selected sweet material. The results are also given of a preliminary trial of bulk selected plants of low coumarin content together with two bitter varieties, *M. dentata* and lucerne, information being provided on the dry matter contents of various parts of the plants tested. The sweet material at Gülzow shows considerable variability in form so that it should be possible to develop types with satisfactory agronomic characters. No relationship has been observed between low coumarin content and susceptibility to *Peronospora*.

1673 Zachow, F.
Ergebnisse der Bestäubung mit Pollengemischen bei *Lupinus angustifolius* und *Lupinus luteus*. Beitrag zur Frage der Polyspermie. (**Results of pollination with pollen mixtures in *L. angustifolius* and *L. luteus*. A contribution to the question of polyspermy**).
Züchter 1958 : **28** : 241–52.

In each of a series of experiments carried out at the Research Station for Agrobiology and Plant Breeding at Gülzow-Güstrow, pollen from two different varieties was placed at the same time on the stigmas of a third variety; three different combinations of varieties were used in crosses of *L. angustifolius* and there were seven combinations of varieties of *L. luteus*. A series of control crosses in which only one variety acted as pollen parent was also made. Segregation data were assembled for a number of morphological and physiological characters shown by F_2 progenies. It was found that none of the F_2 plants had inherited characters from both pollen parents. The F_2 generation from each cross consisted of two groups, each resembling in its segregation data one of the control crosses involving the same seed parent; statistical tests proved homogeneity between the group in question and the corresponding control cross. Also in the F_3 progeny no case was found of a plant inheriting characters from both the pollen parents of the original cross. It was therefore concluded that in the combinations studied each egg cell was fertilized by only one kind of pollen and only this kind influenced the development of characters in the offspring. Whereas in mixed-pollen crosses of *L. angustifolius* both pollen parents were responsible for the fertilization of similar numbers of egg cells, in *L. luteus* there seemed to be some selective fertilization favouring one particular pollen parent.

1674 ZACHOW, F.
Über Vererbung und Auffindung einiger röntgeninduzierter Mutationen von *Lupinus luteus*. **(The inheritance and discovery of some X-ray-induced mutations of *L. luteus*).**
Züchter 1958 : **28** : 262–68.

From an X_2 generation of the Gülzow sweet yellow lupin, forms with small seeds were isolated [cf. XXIII, 2771 and XXVII, 1901]. One of these mutants, which also differed from the original form in its slow growth and floral structure, was crossed with the normal form in order to determine the mode of inheritance of the small-seeded character; this proved to be recessive and the gene was designated *parvus*.

Also in an X_2 generation of the Gülzow lupin were forms in which the pod hairs were of medium length, i.e. an average of 1·2 mm. as compared with 1·7 mm. in the normal form; the number of hairs per mm.^{2} was also lower in the mutant. Hair length and hair density varied more over the pod surface in the mutants than in the normal form. The mutant gene responsible for these differences was found to be recessive; it was designated *semilongus*.

The orange-yellow colour of the flowers of some of the X_2 plants was also found to be under the control of a recessive gene. This gene was named *rufus*; it is not allelic to the mutant gene *sulfureus*.

Forms with short sparse hair occurred amongst an X_2 generation of the Gülzow race HE; the hair of these forms differed from that of short-haired mutants, carrying the genes *brevis* and *curtis* [cf. XXVII, 1901], in being straight and of an even shorter length. The pods of these forms dry off after rain almost as quickly as those of naked forms; this is a particularly useful character in plants grown in damp maritime climates. In hair length, these new mutants hardly differed from two races of *L. angustifolius* but the number of hairs per mm.^{2} was considerably lower in the mutants.

Other mutants of race HE had seed which were much less speckled than those of the original form. A single plant of race HEKW was found with white flowers; HEKW has the gene *sulfureus* responsible for sulphur-yellow flowers. Genetical studies of these last three mutants are not yet completed.

1675 HACKBARTH, J.
Die Alkaloidgene der Lupinenarten. **(The alkaloid genes of lupin species).**
Abh. dtsch. Akad. Wiss. Berl. 1957 : Pp. 64.

Genes controlling low alkaloid content in lupin species are surveyed. In *Lupinus luteus* the three genes *dulcis* (*dul*), *amoenus* (*am*) and *liber* (*lib*) are known, occurring in the respective strains 8, 80 and 102; the first determines a content of 0·05%, the other two 0·01%. A further gene *v*, distinct from the other three, is found in V351. The *L. angustifolius* strains 411, with 0·05% alkaloids, 415, with 0·1%, and RSt14, with a content so low as to be hardly measurable, carry the respective genes *iucundus* (*iuc*), *esculentus* (*es*) and *depressus* (*dep*). In some interstrain crosses, intermediate types appeared which could be attributed to the action of genes modifying the expression of *iuc*. In *L. albus*, Müncheberg 19 and Müncheberg 246 both carry *mitis* (*mit*), while Kraftquell and K703 appear to have the gene *pauper* in common. A further gene named *nutricius* (*nut*) occurs in Nährquell.

1676 ATABEKOVA, A. I.
(A botanical and geographical description of the genus *Lupinus*).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev. agric. Acad.) 1958 : No. 4 : 49–54. [Russian].

The principal morphological and biological differences between species from the western and eastern hemispheres, respectively, are described.

1677 Plarre, W. & Vettel, F.
Vergleichende Untersuchungen an mehrjährig durchgeführten Saatzeiten- und Vernalisationsversuchen mit *Lupinus albus*. (**Comparative investigations on sowing-date and vernalization tests of *L. albus*, carried out over several years**).
Z. Pflanzenz. 1958 : **40** : 125–50.

In sowing-date trials conducted at Hadmersleben, Germany, during the period 1942–57, the early, thermoneutral lines 1809 and 667 and the early, thermolabile lines 2611 and 2635 all gave the highest seed yields when sown at the earliest possible date. With later sowing dates, the two latter varieties showed a great decrease in yield and greater increases in plant height, length of maturity period and green matter production than the two former. Vernalization of the thermolabile forms resulted in a decrease in plant height, in a shortening of the total maturity period and of the period up to flowering, and in a lowering of seed yield per plant and of 1000-seed weight. The thermoneutral plants showed little response to vernalization except for a marked decrease in the length of the period from emergence to flowering. Photoperiod appeared to be without effect. Since the differences induced by vernalization are more marked and more consistent than those resulting from differences in sowing date, the former is recommended as a method for selecting early, thermoneutral forms tolerant of late sowing.

1678 Sváb, J. (Mrs.)
A sárgavirágú csillagfürt nemesítésének hazai eredményei. (**Results of yellow lupin breeding in Hungary**).
Agrártudomány 1958 : **6** : 21–26.

In 1949 the yellow lupin Gyulatanyai sárgavirágú édes [Gyulatanya Yellow-flowered Sweet] developed a disorder of unknown nature causing sterility and characterized by narrowing of the leaves. Since the disorder does not attack early-flowering lupins, it has proved possible to breed new and more resistant varieties by shortening the maturation period; among these are Gyulatanya 784 and 911, both of which have done well in trials.

1679 Ali, S. I.
Notes on the genus *Astragalus* Linn. from W. Pakistan and N.W. Himalayas.
Kew Bull. 1958 : No. 2 : 303–18.

The new taxa described include *A. chitralensis*, *A. toppinianus*, *A. flemingii* and *A. pseudopsilacanthus*.

1680 Smirnova-Ikonnikova, M. I. & Garanina, L. S.
(**A collection of *Lathyrus*—initial material for breeding fodder varieties rich in protein**).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. 4 : 23–27. [Russian].

Data on the content of protein in the seed and of ash and protein in the green matter of a collection of *Lathyrus* varieties and forms from the Institute of Plant Industry are presented. A number of *L. sativa* forms, especially those originating from Čeljabinsk, the Ukraine, Azerbaijan, Bulgaria and England, had a higher protein content in the seed than the standard variety Stepnaja 287 [Steppe 287], and a form of *L. tingitanus* with 44·3% protein was superior to all varieties and forms in this respect. *L. sativa* forms from the Tambov and Amur provinces, Abyssinia, Bulgaria, Palestine and Spain had the highest protein content in the green matter.

ROOTS AND TUBERS

1681 Kuzdowicz, A.
Identyfikacja stopnia poliploidalności u buraka (*Beta vulgaris* L.) na podstawie liczby ujść łagiewkowych pyłku. (**Identification of degree of polyploidy in beet (*B. vulgaris* L.) on the basis of the number of pores in the pollen grain**).
Acta Soc. Bot. Polon. 1958 : **27** : 491–500.

The number of pores visible on the surface of a pollen grain is 6–8 for diploid sugar beets and generally 14–16, but sometimes more than 20, for tetraploids. Triploids are intermediate in number but vary. Similar differences occur in mangels and in natural polyploids of wild beet species.

1682 Jähnl, G.
Ergebnisse der Rübenversuche des Jahres 1957. (**Results of the root trials of the year 1957**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1958 : No. 45 : Pp. 80. (Mimeographed).

Full details are presented of results of varietal trials of mangels, sugar beets, swedes and turnips; these trials were carried out at Gumpenstein and other centres in Austria.

1683 Urban, R.
Analyse der Färbungen der *Beta*-Rüben, insbesondere der Futterrüben. (**Analysis of the pigmentation of *Beta* roots, especially of mangels**).
Züchter 1958 : **28** : 275–83.

By means of high voltage ionophoresis, the nitrogenous pigments of a series of mangels were separated; 13 yellow or orange flavocyanins and five violet betanins were found, their characteristic properties being described. Yellow or orange coloured mangels only contained flavocyanins whereas red mangels and beetroots contained betanins as well, these latter never occurring in the absence of flavocyanins. Differences in the colouring of the skin of the root were found to be related to the relative proportions of the different pigments present; more pigments were found to be involved in the colouring of the root skin than in the colouring of other organs such as the leaves.

The flavocyanins are formed in the root skin only in the presence of the gene *G*, another gene *R* being responsible for the production of betanins; it is suggested that substances produced in the presence of *G* are necessary for the manufacture of betanins under the influence of *R*.

Differences between individual plants and varieties in the relative proportions of the pigments present could result from the existence of multiple allelic series at the *G* and *R* loci. Alternatively additional unknown genetic factors may influence the quantities of the different pigments produced in the presence of *G* and *R*.

1684 Garber, E. D. & Shaeffer, S. G.
Free histidine content of turnip varieties and their resistance to histidine requiring mutants of *Erwinia aroideae*.
J. Bact. 1957 : **74** : 392–95.

The reactions of individual roots of 12 plants of three varieties of turnip to three histidine-requiring mutants of *E. aroideae* were determined, together with the histidine concentration of each root. In one variety, resistance to all mutants was correlated with a relatively low histidine concentration but two of the three mutants also showed avirulence, or greatly diminished virulence, for certain plants of each variety, although the histidine content in each case was apparently adequate for growth and was greater than that of some susceptible plants. It is suggested that aminoacid antagonism or inhibition may be involved.

1685 Garber, E. D.
Further data on the concentration of free histidine of turnip varieties and their response to inoculation with histidine-requiring mutants of *Erwinia aroideae*.
Amer. J. Bot. 1958 : **45** : 523–25.

A repetition of experiments carried out in 1956 gave results which did not confirm the original observations [cf. 1684]. Compared with their behaviour in 1956, the varieties differed in their resistant and susceptible reactions to the mutants. The mean concentrations of histidine in each variety also differed in 1956 and 1957. These discrepancies are ascribed to nongenetic factors. The nature of the resistance of plants with apparently adequate concentrations of histidine for the proliferation and metabolism of the mutants is discussed.

1686 Melding om verksemda til det Kgl. Selskap for Norges Vel i tida 1. juli 1957 til 30. juni 1958. (**Report on the activities of the Royal Society for the Welfare of Norway from 1 July, 1957, to 30 June, 1958**).
Tidsskr. norske Landbr. 1958 : No. 8 : Tillegg : Pp. 64.

At Hellerud, a new swede, Bangholm Hellerud, developed from crosses among selected families of the Bangholm strains Olsgård, Gokstad and Øtofte, has been released. Similar to Bangholm Olsgård in yield of dry matter, it is more resistant to club root and is expected to replace this strain.

Breeding of turnips has been initiated.

1687 Palmer, T. P.
Split petals in crucifers.
Heredity 1958 : **12** : 417–28.

Plants having some flowers bearing divided petals were observed in populations of swede, curly kale, radish and evening scented stock. The proportion of abnormal flowers on one plant varied from time to time in swede and radish; the number of abnormal petals varied more on radish than on swede, this number being correlated with the proportion of flowers affected. In both radish and swede populations, lines could be distinguished with differing proportions of abnormal plants, the degree of abnormality being correlated with this character. These populations produced no true breeding normal plants, although the proportion of abnormal flowers was extremely low on some plants.

It was concluded that certain genotypes are more likely to produce abnormal flowers than others.

In crosses between abnormal swede plants and another variety, in which the abnormality had not been observed, "the results could be explained by assuming that one dominant gene with varying penetrance rates in the homozygous and heterozygous condition determined whether or not plants would, or could produce abnormal flowers". It was also suggested that this dominant gene and its modifiers produce their effect by increasing the production of a substance which initiates petal differentiation.

1688 Gall, H.
Untersuchungen zur Auswertung langjähriger Sortenversuche bei Kartoffeln. (**Investigations on the evaluation of potato varietal trials extending over a number of years**).
Z. landw. Vers.-UntersuchWes. 1957 : **3** : 319–390.

A detailed statistical analysis is made of the results of potato variety trials held in the German Democratic Republic during 1948–55 at 20–30 locations. Analysis of variance revealed interactions between variety, location and year. However, it was found that if the localities are suitably grouped, the reactions of the varieties within each group become parallel. The area comprising such a group of localities is termed a vareal; six potato vareals are distinguished within Eastern Germany.

The varieties are classified in two ways: (1) according to degree of earliness and (2) according to the stringency of edaphic requirements.

Since the variety x year interaction is significant, the dangers of releasing new varieties on the results of trials in abnormal years are pointed out. It is recommended that new varieties should be released only after trials occupying a minimum of 4 plots at 6 localities for 4–5 years for each vareal.

1689 I risultati della sperimentazione collegiale sulla patata. (**The results of collective experiments on potatoes**).
Sementi elette 1958 : **4** : No. **4** : 44–48.

Tests of a number of varieties in 38 different localities in Italy have shown that Tonda di Berlino (= Böhms Allerfrüheste Gelbe [Böhm's Yellow Earliest-of-All]), Majestic and Bintje are those with the highest yielding capacity. Under certain circumstances these varieties may be equalled or surpassed by Ackersegen, Bona, Kennebec, San Michele or Solanum. For early potatoes Vera, Saskia and Sirtema were the best and for starch Nova, Maritta, Panther and Benedikta.

1690 Escribano, Isava F.
Ensayos sobre variedades de patata realizados durante el período 1949–1956. (**Trials of potato varieties conducted during 1949-56**).
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 335–530.

In yield trials of 132 varieties, conducted at Vitoria, Spain, the new clone A–41, now named Duquesa [Duchess], showed much promise among early varieties, although tested for only one year. Among midseason varieties, Olalla was outstanding and among late varieties Sabina and Agnes were best. In investigations on time of tuber formation at Vitoria, the earliest varieties were Palogán and Bintje; A–41 and Olalla were also early. Yield trials in other regions of Spain are also reported; in these, Olalla and Sabina were again among the best midseason and late potatoes respectively, while Arran Banner was one of the most productive early varieties.

1691 **Potato Handbook, 1959.**
Potato Assoc. Amer. New Brunswick, NJ 1959 : **4** : Pp. 64.

This issue includes an article by H. M. Darling on North American potato varieties, providing information on the origin and characteristics of some 120 varieties, and another article on Breeding new varieties of potatoes, giving a short general account of aims and methods.

Abstracts of papers presented at the Forty-Second meeting of the Potato Association of America held at Indiana University, Bloomington, Indiana, Augst 25, 26, 27, 1958.
Amer. Potato J. 1958 : **35** : 721–29.

1692 *Hougas, R. W. & Peloquin, S. J. Genetic variation among haploids of the common potato.* (*p. 722*).

Haploids of *Solanum tuberosum* showed wide ranges of variability in plant characters. Pollen stainability also varied widely (0–80%). Some haploids were both ♂ and ♀ fertile in matings with other haploids and certain diploid species. Although several of the haploids are ♂ sterile, none which have flowered so far is completely ♀ sterile [cf. XXVIII, 4377].

1693 *Magoon, M. L., Hougas, R. W. & Cooper, D. C. Cytological studies of diploid solanums, section Tuberarium.* (*p. 723*).

Study of meiosis in 15 diploid species and 30 hybrids between diploid species has led to the conclusion that structural differences between homologous chromosomes are not extensive [cf. XXVIII, 4385 and 4393].

1694 *Niederhauser, J. S., Graham, K. & Romero, S. Relationship between race and sexual compatibility groups in* Phytophthora infestans. *(pp. 723–24).*

Sixteen races of *Ph. infestans* have been isolated in Mexico. A hundred-and-four cultures, identified as to race, were paired with cultures of known sexual compatibility; 36% fell into one compatibility group and the remaining 64% into the other. Sexual-compatibility type and race were not correlated.

1695 *O'Keefe, R. B. & Jorgensen, T. Development and use of an optical planimeter to measure leaf areas of potato plants. (p. 724).*

The six varieties measured differed considerably in pattern of increase in leaf area. Curves for tuber production corresponded with those for increase in leaf area or were inversely proportional to them, according to the variety.

1695a *O'Keefe, R. B. & Werner, H. O. Preliminary report on physiological and genetic studies of heat resistance in* Solanum tuberosum. *(pp. 724–25).*

In field studies, varieties differed greatly in physiological responses to high temperature or lack of soil moisture and in the extent and nature of tissue destruction. In heat-machine tests (116° F., 60% relative humidity, 5 hr.), correlations were found between (1) severity of wilting and tissue destruction, and (2) tissue destruction, plant height and amount of subsequent lateral growth of the tops. Tuber production was inversely proportional to extent of tissue destruction and subsequent lateral growth of the tops. The critical temperature is defined as the maximum which plants could withstand without direct heat injury. The tolerance of various clones with respect to the critical temperature was slightly lower with original seedling plants than with those grown from tubers, but the physiological responses and morphological effects were similar for the two types of material. Concerning the inheritance of resistance, heat-machine tests indicated the following. (1) The mean resistance of progenies from highly resistant x susceptible combinations exceeded that of selfed progenies of susceptible parents. (2) The mean degrees of resistance of S_1 progenies were comparable, whether the parents were resistant or susceptible. (3) The mean degrees of resistance of S_2 progenies of susceptible and resistant parents pointed to the possibility of selecting for resistance. (4) The mean resistance of progenies of crosses between highly resistant parents (heterozygous or inbred) surpassed that of selfed progenies of either parent. (5) The mean resistance of progenies from inbred combinations of the type susceptible x resistant was greater than that of progenies from crosses of "heterozygous susceptible by resistant parents." These results suggest that heat resistance may be improved by inbreeding, followed by hybridization. Further genetic study is however required before conclusions can be drawn.

1696 *Peloquin, S. J. & Hougas, R. W. The use of decapitation in interspecific hybridization in Solanum. (p. 726).*

Stems obtained by decapitation of field-grown plants of Katahdin, at the time of opening of the first flower, were placed in the greenhouse in milk bottles containing tap water or nutrient solution. Using *S. phureja* as ♂, about 500 pollinations of this material were made during a period of one week. During the same period, an equal number of pollinations of Katahdin by the same *S. phureja* parents were effected in the field. Only 10 seeds with embryos were obtained from pollinations in the field whereas 157 good seeds resulted from pollination of the cut shoots. Other interspecific matings gave similar results.

1697 *Shark, A. E. A comparison of microsporogenesis in fertile and sterile potato varieties. (p. 726).*

A comparison was made of microsporogenesis in Katahdin, Sebago and B595–76, respectively fertile, partially fertile and sterile as regards pollen production. Many of the inner tapetal cells in Sebago were slightly plasmolysed before microsporogenesis. The outer tapetal layer and microsporocytes were not visibly affected. Microsporogenesis in B595–76 was characterized by plasmolysis of both the inner tapetum and PMCs. The low degree of fertility of Sebago and sterility of B595–76 are ascribed to the observed plasmolysis, which in turn is attributed to a nutritional deficiency caused by high temperature.

1698 *Webb, R. E. & Schultz, E. S. On the nature of resistance to the potato leafroll virus. (p. 728).*

Three types of resistance to infection by leaf roll have been distinguished. (1) Aphid counts in forced colonization tests in the greenhouse and natural infestations in the field indicated that leaf-roll resistance may be due to plant resistance to colonization by *Myzus persicae* and, to a lesser extent, by *Aphis rhamni*. This type of resistance is shown by B2834–3. (2) Resistance may be closely associated with the prevailing temperatures. X927–3 is virtually immune from infection at 22° C. and below, even with heavy colonization of infective *M. persicae*, but at 27° C. and above is susceptible, suddenly wilting 10–14 days after inoculation and subsequently dying. (3) The third type of resistance is shown by B579–3 and some other selections, only a small percentage of plants becoming infected by heavy populations of *M. persicae* over a temperature range of 20° to 28° C.

1699 Ludwig Fittschen zum 65. Geburtstag. **(To Ludwig Fittschen on his 65th birthday).**
Kartoffelbau 1958 : **9** : p. 188.

A brief account is presented of the work of this potato breeder.

1700 Marks, G. E.
Cytogenetic studies in tuberous Solanum species. II. A synthesis of *Solanum* x *vallis-mexici* Juz.
New Phytol. 1958 : **57** : 300–10.

Both Bukasov and Hawkes have suggested on morphological and geographical grounds that *S.* x *vallis-mexici* ($2n = 36$) is a natural hybrid between *S. verrucosum* ($2n = 24$) and *S. stoloniferum* ($2n = 28$). In order to test this hypothesis, morphological and cytological comparisons were made between *S.* x *vallis-mexici* and experimental hybrids of its presumed parents at the John Innes Horticultural Institution, Hertford. Two familes of *S. verrucosum* were crossed with four varieties of *S. stoloniferum*, CPC 9·1, 9·2, 1331 and 2282·3.

The number of hybrids obtained relative to the number of seeds sown was rather low. Hybrids were most infrequent using *S. stoloniferum* CPC9·1 as the male parent whereas *S. stoloniferum* CPC2282·3 was almost twice as effective; this clone also gave the highest percentage berry set and number of seeds per berry. It is suggested that CPC2282·3 has greater affinities with *S. verrucosum* than any of the other clones. The hybrids were markedly similar morphologically to *S.* x *vallis-mexici*, this being most marked for the hybrids of CPC1331. The leaflet indices of the hybrids followed closely the index of the particular *S. stoloniferum* parent used. Whereas clones of CPC 9·1, 9·2 and 1331 had corollas similar in shape to those of *S.* x *vallis-mexici*, hybrids of CPC2282·3 had corollas resembling those of *S. verrucosum.*

In the two clones of *S.* x *vallis-mexici* examined at metaphase I there was a low frequency of trivalent formation; the most common form of pairing resulted in 12 bivalents and 12 univalents per cell. This indicated that the chromosome complement consists of two similar genomes and one dissimilar genome. Some autosyndetic pairing was also observed, usually resulting in 13 bivalents and 10 univalents per cell. Chiasma frequency per bivalent was high, most bivalents being of the ring type. Univalents divided at either the first or second division; they were either included in the tetrad nuclei or formed micronuclei. All the nuclei degenerated after the tetrad stage, no viable pollen being produced.

Meiosis in the triploid hybrids was similar to that of *S.* x *vallis-mexici*, this being particularly marked in hybrids of CPC1331. All the hybrids showed a low frequency of trivalents per cell, the mean frequency of trivalents being lowest in hybrids of CPC1331; the frequency was significantly higher in hybrids of CPC2282·3. All hybrids with CPC1331 as male parent were male sterile; in the other groups of hybrids the pollen fertility was very low. A tetraploid hybrid had chromosome pairing essentially similar to that found in certain other tetraploid interspecific hybrids of *Solanum*. These results are thought to support the hypothesis being tested. It is supposed that *S.* x *vallis-mexici* received one genome from *S. verrucosum* and two genomes, differing slightly from each other, from *S. stoloniferum*. It is also suggested that the name *S.* x *vallis-mexici* should be applied to all forms of hybrids between *S. verrucosum* and *S. stoloniferum*, even if they do not conform to the type.

1701 Magoon, M. L., Hougas, R. W. & Cooper, D. C.
Cytogenetic studies of tetraploid hybrids in *Solanum* from hexaploid-diploid matings.
J. Hered. 1958 : **49** : 171–78.

A study was made of microsporogenesis in tetraploids obtained by crossing *S. demissum* with *S. berthaultii*, *S. gibberulosum*, *S. goniocalyx*, *S. gigantophyllum*, *S. phureja*, *S. saltense*, *S. soukupii* and *S. simplicifolium*. Meiosis was usually irregular in all the hybrids, showing such abnormalities as multivalents, univalents, laggards, elimination of chromosomes, chromatin bridges and fragments. Interspecific chromosome homology is discussed against the background of the problems of the genomic make-up of *S. demissum* and basic chromosome number of the genus and in relation to univalent formation. Pollen fertility was very low and all the hybrids failed to produce seed when selfed. These results suggest that the value of crosses of the type ($6n$ x $2n$) F_1 x *S. tuberosum* as a means of developing improved varieties is limited.

1702 Heiken, A.
Aberrant types in the potato.
Acta agric. Scand. 1958 : **8** : 319–58.
Aberrant types described in the literature and observed by the author are surveyed under the headings tuber shape, tuber colour, flesh colour, stem shape, stem colour, leaf shape, leaf colour, flower shape, flower colour, bolter, wilding and feathery wilding. The three last mentioned types, together with two tuber-colour, six leaf-shape and three leaf-colour aberrants, have been isolated and found to remain constant during vegetative propagation; grafting experiments showed that none of the aberrant forms was due to virus infection. The frequency of the bolter was 1·5–1·8 x 10^{-3} while that of each of the other types studied fell within the range 1·2–8·4 x 10^{-5}; the frequency varied according to variety.

1703 Howard, H. W.
Transformation of a monochlamydius into a dichlamydius chimaera by X-ray treatment.
Nature, Lond. 1958 : **182** : p. 1620.
The potato Red King arose as a somatic mutant of King Edward. It has tubers which are full pink except for small white patches at the heel end and beneath some of the eyes, whereas King Edward produces white tubers with pink splashes round the eyes. The occurrence of the small white patches suggests that Red King is a periclinal chimera in which only layer I has changed. This supposition has been confirmed by the fact that the progeny of Red King x a white-tubered parent include plants with tubers of the King Edward type, as well as by the recovery of tubers of the last-mentioned type from both eye-excision and X-ray experiments. One of the plants grown from irradiated tubers produced tubers of the Red King type but without the small white areas; that both layers I and II were of the Red King type was confirmed by the results of crossing with a white-tubered parent, plants bearing only full pink or white tubers being obtained.

1704 Höppner, E.
Die neuen Kartoffelsorten des Jahres 1958. (**The new potatoes of the year 1958**).
Kartoffelbau 1958 : **9** : p. 107.
Tabulated data are provided on the maturity period and morphological characters of 13 varieties; these include varieties for human consumption and others suitable for industrial purposes.

1705 Lori, eine neue Speisekartoffel. (**Lori, a new culinary potato**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1958 : **6** : 159–60.
M., J.
La variété de pomme de terre Lori introduite dans l'assortiment officiel suisse. (**The potato variety Lori introduced into the Swiss official list**).
Rev. rom. Agric. 1958 : **14** : 83–84.
Lori, originating from the cross Sämling [Seedling] x Fichtelgold, is said to be highly resistant to virus Y and markedly tolerant of leaf-roll virus; it is less susceptible to *Phytophthora infestans* than Bintje. It is a mid-early variety with yellow flesh and shallow eyes. Lori has a higher starch content than Bintje and its cooking quality is good [cf. XXIII, 2034, and XXVI, 2501].

1706 Sortenbeschreibung. (**Description of varieties**).
Dtsch. Landw., Berl. 1958 : **9** : 551–52.
Detailed descriptions are provided of the mid-late potato varieties Schwalbe [Swallow], Spatz [Sparrow] and Argo; they are all suitable for human consumption and industrial purposes. The first two varieties were bred at the Plant Breeding Institute, Gross-Lüsewitz, and the third at Malchow auf Poel.

Schwalbe, [cf. XXVII, 1917], arose from the cross Aquila x Capella. The tubers have flesh of a light yellow colour, the skin being white and the eyes rather shallow; there is only a slight tendency to sprouting. This variety gives rather a low yield of tubers of average starch content. The tubers do not become floury during cooking and the taste is of good to average standard. Schwalbe is noteworthy for its high resistance to the leaf roll, Y, Y–Al and A viruses; it has also shown some resistance to *Phytophthora infestans* but is susceptible to *Streptomyces scabies*. In their young stages, the plants develop rather slowly but development may be accelerated by pregermination.

Spatz originated from the cross Capella x BRAD79. The flesh is light yellow, the skin white and smooth and the eyes shallow or of average depth; the tendency to sprouting is either average or lower than average. This variety is resistant to leaf roll and viruses Y, Y–Al and A; its leaves are resistant to races 0 and 4 of *Ph. infestans* and show average field resistance to races 1 and 1,4, the tubers being of average susceptibility. Spatz is susceptible to scab. It gives a good average yield of tubers and a high yield of starch. This variety has a disadvantage in that the tubers may become deformed during unfavourable weather conditions.

Argo, developed from the cross Capella x BRA9089, has rather large tubers with yellow flesh, a slightly rough white skin and rather shallow eyes. This variety is susceptible to leaf roll and mosaic viruses; it is slightly susceptible to the Y and Y–Al viruses. The leaves show average field resistance to *Ph. infestans* and the tubers are slightly attacked. Argo gives a good yield of tubers with an average starch content. This variety is particularly suitable for rather damp regions.

1707 López Campos, G. & Zubeldia Lizarduy, A.
Estudio y descripción de variedades antiguas de patata cultivadas en España. **(Study and description of old potato varieties cultivated in Spain).**
An. Inst. nac. Invest. agron., Madr. 1958 : **7** : 265–331.

Synonyms and information on the tubers, buds, branches, leaves, flowers, fertility, earliness, susceptibility to late and early blight, drought tolerance and degree of virus infection are given for 19 old Spanish varieties maintained in the collection at the Potato Breeding Station, Vitoria.

1708 Johnston, G. R., Davies, H. T. & Lawrence, C. H.
Huron, a new white, late maturing variety of potato resistant to common scab.
Amer. Potato J. 1958 : **35** : 715–20.

Information is provided on the characteristics of Huron (Hindenburg x Sebago) and its performance in New Brunswick and Ontario [XXVIII, 1297].

1709 **(The new potato varieties, Ljubimec and Jaroslavskij).**
Kartofel' (Potato), Moskva 1958: No. **3** : p. 59. [Russian].

Ljubimec [Favourite] (5419s/44 x Hindenburg) and Jaroslavl' (Moscow x Mihnevskij) were bred at the Potato Institute. The former is an early variety resistant to *Phytophthora* and *Synchytrium* and is productive of large white tubers with shallow eyes. It has a starch content of 20% and its flavour and keeping properties are good. The other variety is a midseason type resistant to *Phytophthora* and has a starch content of 16–18%.

1710 Fabiani, L.
Considerazioni sulle "varietà locali" di patata. **(Considerations concerning the local varieties of potato).**
Sementi elette 1958 : **4** : No. 5 : 28–31.

Many excellent potato varieties are now disappearing or have already disappeared. Thus Bianca comasca [Como White], which appeared under various names in a number of localities in Italy and also in Jugoslavia, is now hard to find, as are others such as Gialla del Fucino [Fucino Yellow] and Gavesa in Sardinia. Certain extremely early varieties have persisted. Some of the old varieties such as Bianca del Molise [Molise White] have a starch content of 20% and Riccia [Curly] yields up to 500 c. of tubers per ha. and a plea is made for an effort to save some of them from extinction.

1711 Eröffnung der Landwirtschaftlich-Biologischen Station Neversdorf. **(Opening of the Agricultural-Biological Station, Neversdorf).**
Kartoffelbau 1958 : **9** : p. 142.

A brief mention is made of the work of this station, which is especially concerned with the breeding of polyploids. The director of the station considers it possible to develop octoploid potatoes, resistant to viruses and nematodes, without using primitive or wild forms in the breeding programme.

1712 Lebedeva, N. A.
(Obtaining polyploids of *Solanum polyadenium* Greenm.).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **122** : No. **4** : 890–92. [Russian].

Morphological descriptions are given of the above diploid species and of colchicine-induced tetraploids obtained at the Institute of Plant Industry. The diploid is interesting for resistance to *Leptinotarsa*, viruses A, X, Y and other diseases, but it does not cross with cultivated varieties of *S. tuberosum*. The tetraploids were taller and had larger and darker leaves and larger flowers and yielded more tubers than the diploids; they were immune from *Phytophthora*.

1713 Hougas, R. W. & Peloquin, S. J.
The potential of potato haploids in breeding and genetic research.
Amer. Potato J. 1958 : **35** : 701–07.

The value of haploids ($2n = 24$) of *Solanum tuberosum* is discussed with reference to (1) development of a higher degree of homozygosity at the normal tetraploid level, (2) comparison of genetic ratios obtained from haploids and the $2n = 48$ material derived from them by colchicine treatment, (3) investigation of gene dosage effect, (4) synthesis of tetraploid tester stocks, (5) determination of the effect of chromosome number on vigour and productivity, (6) gene transference from wild and cultivated diploid species to *S. tuberosum* and (7) research on the nature of polyploidy in *S. tuberosum*, chromosome differentiation and other fundamental genetical and cytogenetical problems.

1714 Hougas, R. W., Peloquin, S. J. & Ross, R. W.
Haploids of the common potato.
J. Hered. 1958 : **49** : 103–06.

At the Potato Introduction Station, Sturgeon Bay, Wis., crosses were made between 10 selections of the common tetraploid potato and seven selections of diploid potato species, these latter being used as the pollen parents. Parental stocks with contrasting genetic characters were used so that the phenotype of the F_1 hybrids would be distinct from that of haploids arising through parthenogenesis. From 6041 pollinations, 806 seedlings were obtained; amongst these seedlings, 28 haploid plants of *S. tuberosum* with $2n = 24$ were found. The haploid plants were smaller and less vigorous than either the F_1 hybrids or the *S. tuberosum* selection from which they originated; the leaflets of the haploids were small and narrow. Considerable variation occurred among haploid sibs of the variety Katahdin. Large numbers of haploids are required for research in potato genetics and breeding and some means of increasing the frequency of haploids is necessary; accordingly studies on the effect of various factors on haploid frequency are now under way. Since the frequency of haploids in maize is known to be affected by the staminate and pistillate parents, a survey of the parental material used in producing haploid potatoes seems to be a promising beginning for these investigations.

1715 Peloquin, S. J. & Hougas, R. W.
Fertility in two haploids of *Solanum tuberosum*.
Science 1958 : **128** : 1340–41.

Both haploids arose parthenogenetically in interspecific matings of *S. tuberosum*. One haploid (US–W1), from Katahdin, is highly pollen fertile, 60–75% of the grains staining with acetocarmine. A limited number of self pollinations have not resulted in any fruit. As ♂, this haploid has been successfully crossed with *S. kurtzianum*, *S. neohawkesii*, *S. phureja* and *S. simplicifolium*, all 24-chromosome species, and with *S. tuberosum*. Meiosis was fairly regular, 12_{II} being found at metaphase I in over two-thirds of the PMCs. The other haploid (US–W3), from the breeding selection Minn. 15–2–10–1–2, has only 5–15% stainable pollen. It is highly irregular meiotically, less than 10% of the PMCs containing 12_{II}. Univalents, multivalents, chromatid bridges and micronuclei were observed. This haploid has so far failed as ♂ parent but as ♀ has crossed readily with *S. phureja*.

1716 Bretan, I., Bretan, C., Tănăsescu, E. & Ulmamei, P.
Contribuţii la studiul creşterii şi a ritmului de acumulare a substanţelor nutritive în tubercule la opt soiuri de cartofi. **(Contributions to the study of the growth and rhythm of accumulation of nutritive substances in the tubers of eight potato varieties).**
Stud. Cercet. Agron., Cluj. 1957 : **8** : 241–56.

A comparative study of tuber development and starch and protein accumulation in eight, mainly German, varieties is presented. Rhythm of development is not necessarily closely correlated with maturation period. Some late varieties, such as Merkur, accumulate more reserves in the tubers in the early stages of growth than early varieties. Some late varieties reach their maximum tuber production by the time that the leaves turn yellow; in Ackersegen, tuber production increases till the onset of frost.

1717 Kiper, I. M.
(A method of raising potato hybrid seedlings from seed in breeding for earliness).
Kartofel' (Potato), Moskva 1958 : No. 3 : 50–52. [Russian].

A higher percentage of the progeny of Cobbler x Majka [May], Courier x Épron, seedling 66 x Majka and seedling 357/47 x Majka was early when the seed was sown in summer instead of, as customary, in spring. Mention is made of seedling 110a/52. It was earlier and more productive than the early variety Warba and had shallow eyes and good flavour.

1718 Magoon, M. L., Cooper, D. C. & Hougas, R. W.
Induced polyploids of *Solanums* and their crossability with *S. tuberosum*.
Bot. Gaz. 1958 : **119** : 224–31.

Colchicine-induced tetraploids of a large number of diploid *Solanum* species and interclonal and interspecific hybrids were studied. The tetraploids were slower in development and flowered later than the corresponding diploids. They had thicker and more hairy leaves of a dark green colour; also the leaflet length-breadth index was lower and the stomata and flowers were larger than those of the diploids. Considerable variation in growth habit, vigour and pollen and seed production was found within families of tetraploids and in the F_1 progenies between the polyploids and *S. tuberosum.* Also pollen stainability showed interclonal and intraplant variation; it was reduced in all the induced polyploids as compared with the corresponding diploids, the reduction being more marked in certain cases. The diploid hybrid *S. pinnatisectum* x *S. jamesii* had 93·5% stainable pollen and the corresponding value for the reciprocal cross was 93·6%. Induced tetraploids of *S. pinnatisectum* x *S. jamesii* had less fertile pollen than the diploid and in the tetraploid of the reciprocal hybrid, the pollen fertility was decreased by 63%. All the polyploids had larger pollen grains than the diploids and the grains usually had four germ pores.

S. pinnatisectum, S. toralapanum, S. verrucosum, S. neohawksii, S. macolae, S. rybinii and *S. stenotomum* are to a great extent self sterile at the diploid level but tetraploids of these species were found to be more self fertile. Diploid *S. saltense* produced no seed after selfing whereas selfed tetraploids of this species produced many seeds. No seed was produced on selfing the tetraploid *S. rybinii* x *S. yabari* but the tetraploids of *S. pinnatisectum* x *S. jamesii* and its reciprocal, *S. simplicifolium* x *S. gigantophyllum, S. verrucosum* x *S. gibberulosum, S. yabari* x *S. gibberulosum, S. gibberulosum* x *S. tarijense, S. tarijense* x *S. rybinii* and its reciprocal, *S. rybinii* x *S. gibberulosum, S. rybinii* x *S. saltense* and *S. phureja* x *S. gibberulosum* all gave fair amounts of seed after selfing.

Under conditions of open pollination, the tetraploids of interclonal hybrids of *S. macolae, S. phureja, S. rybinii, S. stenotomum* and *S. kesselbrenneri* produced more seed balls per plant and more seeds in each ball than the corresponding diploids. Also $4n$ plants of *S. yabari* x *S. gibberulosum* surpassed the diploid forms in seed production after open pollination; other interspecific hybrids under similar conditions gave approximately the same amount of seed at both the $2n$ and $4n$ levels.

Most of the induced polyploids were successfully crossed with *S. tuberosum,* the polyploids being used as the mother plant. Artificial tetraploids of *S. gibberulosum* x *S. tarijense, S. tarijense* x *S. rybinii, S. verrucosum* x *S. rybinii, S. verrucosum* x *S. saltense, S. verrucosum* x *S. yabari* and *S. yabari* x *S. gibberulosum* produced some seed when crossed with *S. tuberosum* 'Katahdin'. The F_1 hybrids between the tetraploids and Katahdin gave varying amounts of seed following open pollination. The frequency of cytological abnormalities was relatively low in hybrids between the induced tetraploids and *S. tuberosum.* Multivalents in tetraploid hybrids indicated pairing between parental genomes and the possibility of transferring desirable genes. The seed set in both the artificial tetraploids and their crosses with *S. tuberosum* was sufficiently high for the large populations to be obtained which are necessary for the selection of desired recombinants. The utilization of artificial autopolyploids of *Solanum* species is considered to be a promising method of improving cultivated varieties.

1719 HOWARD, H. W.

The storage of potato pollen.

Amer. Potato J. 1958 : **35** : 676–78.

In investigations at the Plant Breeding Institute, Cambridge, England, anthers of the varieties Clarke 650, Ulster Knight, Ulster Premier and Ulster Prince were dried for about 17 hr. either in an oven at 30° C. or in a vacuum desiccator containing a silica gel at room temperature. The two methods of drying were equally satisfactory. The pollen was stored successfully at $-20°$ C. for 11 months, its viability being tested in crosses. Use of the stored pollen resulted in as many seeds per berry as fresh pollen.

1720 KING, J. R. & JOHNSTON, T. M.

Factors affecting Irish potato pollen germination in an artificial environment.

Amer. Potato J. 1958 : **35** : 689–700.

The effects of the following on pollen germination were investigated: drying temperature, sucrose concentration, pH, type of agar medium, temperature and relative humidity. The results indicated that drying of the pollen for 3–6 hr. at about 90° F. and culture on USP 1 shredded agar + 15% sucrose for at least 12 hr. at 60° F. and a relative humidity near saturation offered the most favourable set of environmental conditions for determining viability. Germination was highest at pH 5·2, which happens to be the pH of USP 1 agar. Agar concentrations of 1% and 2% were equally satisfactory. It is however stressed that, on account of the erratic reaction of potato pollen on an artificial medium, a test carried on a particular sample under the above conditions would not necessarily give a reliable indication of general viability.

1721 COOPER, D. C. & RIEMAN, G. H.
Diploid plants in a seedling population of the cultivated potato.
Amer. Potato J. 1958 : **35** : p. 642.

Amongst seedlings resulting from self pollination between selected lines of the cultivated (tetraploid) potato, four plants were found in which the number of stomata per unit area was twice that usually present and the size of stomata and epidermal cells was considerably reduced. Three of these plants were examined cytologically and found to be diploid ($2n = 24$). Similar differences in stomatal size and number have been also observed between diploids and tetraploids of other genera.

1722 HRUŠKA, L.
Příspěvek k problematice jakosti bramborů. (**A study of the problems of potato quality**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 227–38.

The quality of potato varieties for human consumption, fodder and industrial uses is discussed, mainly in relation to chemical composition. Among the Czechoslovak table varieties, the ultraearly Český Erstling [Czech Erstling], Ambra, Jara [Spring], the early Bintje, Keřkovské Rohlíčky [Keřkov Tip], the midseason Mirka [Measure] and the late types Triumf [Triumph] and Karmen are mentioned for high quality.

1723 OPHUIS, B. G., HESEN, J. C. & KROESBERGEN, E.
The influence of the temperature during handling on the occurrence of blue discolorations inside potato tubers.
Europ. Potato J. 1958 : **1** : No. **3** : 48–65.

Of the varieties investigated, Noordeling, a variety rich in starch, was more susceptible to blue discoloration resulting from bruising than Eigenheimer, Furore and Voran. The varieties Bintje, Alpha and Record were least susceptible.

1724 (**Material for breeding tuber crops with a high starch content**).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 82, 88, 94. [Japanese].

A brief review is given of suitable initial varieties and appropriate breeding methods for developing potato and sweet potato varieties with a high starch content. The emphasis is on work along these lines in Japan.

1725 CORRELL, D. S.
A new species and some nomenclatural changes in *Solanum*, section *Tuberarium*.
Madroño, S. Francisco 1958 : **14** : 232–36.

A new species, *S. pennellii*, collected by Weberbauer in Peru in 1910–14 and by Pennell in the same country in 1925 is described. It is closely related to *S. lycopersicoides* from which it differs in the morphology of the leaf and pedicels. The two species form a group intermediate between *Solanum* and *Lycopersicon*.
Two new names are proposed to replace homonyms: *S. hougasii* to replace *S. spectabile* Hawkes, non Steudel; and *S. nelsonii* to replace *S. confusum* Correll, non Morton.

1726 DE VRIES, J. S.
De reactie van vier fabrieksaardappelrassen op verschillende kaligiften. (**The reaction of four industrial potatoes to different levels of potassium**).
Kali, Amsterdam 1957 : No. **34** : 136–38.

Of the varieties Ambassadeur, Prof. Broekema, Rival and Voran fertilized with K_2O at levels of 0, 50, 100, 150 and 200 kg./ha., Rival showed the greatest yield response to high K_2O, followed by Ambassadeur.

1727 ZADINA, J.
Výskyt rzivosti hlíz u brambor. Studium dědičnosti náchylnosti k rzivosti. (**The occurrence of internal rust spot in potato tubers. A study of the inheritance of susceptibility to internal rust spot**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 359–74.

The incidence of the disease among the progenies of many varieties and hybrids was investigated at Česká Bělá and graphs and tables showing heritable differences are presented. Among the approved Czechoslovak varieties, those derived from Jubel or Ovalgelbe [Oval Yellow] gave progenies highly susceptible to internal rust spot, the progenies of Ackersegen and Parnassia being somewhat less susceptible than the others.

1728 HOFFMANN, G. M.
Untersuchungen zur Ätiologie pflanzlicher Actinomykosen. (**Investigations of the etiology of plant actinomycoses**).
Phytopath. Z. 1958 : **34** : 1–56.

In a survey of the occurrence and distribution of plant diseases caused by actinomycetes, attention is primarily given to the potato and beet scabs. It has been found that *Streptomyces scabies* is the sole pathogen responsible for potato scab; it is thought that this knowledge will be of use in developing scab-resistant varieties. The true beet scab is also caused by *S. scabies* but girth scab is not considered to be an actinomycete disease.

1729 Hoffmann, G. M.
Untersuchungen über die Resistenz von Wild- und Primitivkartoffeln gegen den Erreger des Kartoffelschorfes *Streptomyces scabies* Waksman und Henrici. **(Investigations on the resistance of wild and primitive potatoes towards the cause of potato scab, *S. scabies* Waksman and Henrici).**
Züchter 1958 : **28** : 283–85.

The results are reported of investigations carried out at the Phytopathological Institute, Aschersleben, Germany, on the resistance of many strains of primitive and wild *Solanum* species to two strains of *S. scabies*. All the *Solanum* species showed great susceptibility to the pathogen with the exception of *S. polyadenium*, which was highly resistant; a few individual plants of three other species showed only slight symptoms of disease.

1730 Rothacker, D. & Haussdörfer, M.
Eine Methode zur Prüfung von Wild- und Primitivkartoffeln auf ihr Verhalten gegenüber dem Kartoffelschorf, *Streptomyces scabies* (Thaxter) Waksman et Henrici. **[A method for testing wild and primitive potatoes for their reaction to potato scab, *S. scabies* (Thaxter) Waksman and Henrici].**
Züchter 1958 : **28** : 223–28.

This method, developed at the Plant Breeding Institute of Gross-Lüsewitz, involves water culture of seedlings under short-day conditions. In this way a swift development of the tubers is obtained; they are then infected at an early stage with *S. scabies*. The resistance of the seedlings can be judged several weeks later, the experiment having taken about two months to complete.

The material tested included *S. tuberosum* subsp. *andigenum* from 13 different sources and a number of other wild species. None of these proved to be resistant to *S. scabies*, although differences in reaction to the pathogen were observed.

1731 Untersuchungen über die Genetik der Resistenz von Kartoffeln gegen verschiedene Rassen des Kartoffelkrebses und über Inzucht bei Kartoffeln. **(Investigations on the genetics of the resistance of potatoes towards various races of potato wart and on inbreeding in potatoes).**
Forschung und Beratung 1958 : No. 6 : 177–83.

In a report from the Max Planck Institute of Breeding Research, Köln-Vogelsang, tabulated information is provided on the reactions to biotypes of *Synchytrium endobioticum*, viruses and *Phytophthora infestans* of a series of clones originating from various interspecific crosses of *Solanum*. It is thought probable that genes for resistance to *S. endobioticum* do occur in pure *Solanum tuberosum* varieties; they are however more frequent in wild species. Investigations on the mode of inheritance of the resistance are still in progress, use being made of inbred lines.

The mode of inheritance of other characters has also been investigated. As regards tuber shape, round and roundish oval were found to be dominant over oval and long. The shallow-eye character proved to be dominant over more deeply set eyes. Yellow flesh was dominant over colours ranging between light yellow and grey. From clones with light yellow flesh, repeated selection of inbreds has produced deep-yellow forms. Starch content seemed to be determined by many factors. The plant weight tended to decrease in successive inbred generations, although in the S_3 and S_4 generations some clones surpassed the original clones in this respect. Thus plant weight may also be controlled by several factors. Studies of resistance to *Ph. infestans* in the inbred generations of five forms indicated that resistance is a dominant character and susceptibility a recessive character.

1732 Gedz', S. M.
(The nature of potato immunity to wart and ways and means of improving it).
Agrobiologija (Agrobiology) 1958 : No. 2 : 108–17. [Russian].

The use of vegetative hybridization, sowing a variety in summer for one or more generations or the addition of Mn, B, Cu, or Mo to the soil nutrients all proved effective in improving *Synchytrium* resistance. The method of graft hybridization developed at Černovcy has already been described [XXVIII, 3610], and this paper gives tables showing varied degrees of resistance in progenies of a large number of hybrids under conditions of artificial infection. The progenies of Ella/Jubel, Lorh/Ostbote, Lorh/Parnassia and several others were immune.

1733 Prüfung von Kartoffelzuchtstämmen auf Widerstandsfähigkeit gegen Kartoffelkrebs 1957/58. (**Testing of cultivated races of potato for resistance to wart disease 1957/58**).
NachrBl. dtsch. PflSchDienst., Stuttgart 1958 : **10** : 126–27.

In this brief note, mention is made of tests held in Germany to determine the resistance of potatoes to biotypes of *Synchytrium endobioticum*.

1734 Partyka, R. E.
The effects of some environmental factors and of certain chemicals on *Sclerotinia sclerotiorum* in the laboratory and in potato fields.
Diss. Abstr. 1958 : **18** : LC Card No. Mic 58–1514 : p. 1590. (Abst.).

Potato varieties with dense heavy foliage, such as Green Mountain, are said to show a higher percentage of hills infected with *S. sclerotiorum* than varieties with "smaller, upright foliage" such as Katahdin or Kennebec.

1735 Malcolmson, J. F.
A consideration of the species of *Phoma* which parasitize potatoes.
Trans. Brit. mycol. Soc. 1958 : **41** : 413–18.

On the basis of information on pathogenicity to tubers and stems, as well as mycelial, pycnidial and spore characteristics on artificial media and potato tissue, the author suggests that *Ph. solanicola*, *Ph. tuberosa* and *Ph. foveata* should be considered as one species, *Ph. solanicola*. *Ph. eupyrena* is regarded as a separate species.

1736 van Emden, J. H.
Waarnemingen betreffende het parasitisme van *Pellicularia filamentosa* (Pat.) Rogers (= *Rhizoctonia solani* Kühn) ten opzichte van de aardappelplant. [**Observations regarding the parasitism of *P. filamentosa* (Pat.) Rogers (*Rh. solani* Kühn) with respect to the potato plant**].
Tijdschr. PlZiekt. 1958 : **64** : 276–81.

Stems and stolons but not roots were susceptible. In shoots grown on agar, resistance was low at 22° C., moderate at 18° C. and high at 15° C. and at 20° C. could be increased by extending the day length.

1737 Pratella, G.
Rapporti fra la rizoctoniosi della patata e quella della barbabietola. (**Relations between *Rhizoctonia* infection of the potato and beet**).
Ann. Sper. agr. 1958 : **12** : 1299–303.

Fourteen isolates of *Rh. solani* (*Pellicularia filamentosa*) from beets and eight from potatoes were collected. All the strains could infect potatoes but only the isolates from beets were pathogenic to beets.

1738 Symposion über Fragen zur Züchtung nematodenwiderstandsfähiger Kartoffeln in Gross-Lüsewitz. (**Symposium on questions on breeding nematode-resistant potatoes at Gross-Lüsewitz**).
Dtsch. Landw., Berl. 1958 : **9** : 500–01, 549–51.

Brief accounts are provided of papers read at the above international symposium held in July 1958. Schick opened the proceedings and gave a historical survey of the discovery and spread of potato nematodes. Huijsman spoke on methods for estimating the population dynamics of the potato nematode and nematode resistance, their sources of error and their limitation. Roots of both resistant and susceptible plants give out a substance which causes many larvae to leave their cysts and attack the roots; inside the resistant plants, many female eelworms die. A plant is considered to be resistant if it causes a reduction in the number of larvae present in an infected soil. It is important that methods should be available for exact determinations of changes in eelworm populations; with the methods currently used for this purpose, many errors arise on account of the uneven distribution of the eelworms in the soil.

Laboruntersuchungen zur Resistenzprüfung [Laboratory investigations on resistance testing] was the subject of Stelter's paper. It was pointed out that clear differences do not exist between susceptible and resistant potatoes in respect of their stimulatory effect on the hatching of eelworm larvae. Whilst many female eelworms may die in resistant potatoes, a relatively large number of males complete their development. In his lecture, Die unterschiedliche Flächenverseuchung als begrenzender Faktor bei der Bonitierung auf Nematodenbefall der Einzelpflanze [Differential areal contamination as a limiting factor in the assessment of the nematode attack of the individual plant], Nolte pointed out that naturally infected soils differ considerably in the number of cysts present; the chemical and physical properties of the soil and other factors influence the degree of infestation. Differences in soil infestation must be considered when testing either nematicides or the resistance of plants. Reinmuth and Schmidt dealt with questions of population dynamics and of ecological influence on potato nematode attack. Root secretions, temperature, humidity, type and condition of the soil and crop rotation are all mentioned as factors influencing the hatching of eelworm cysts; there is also a yearly rhythm of hatching, this being greatest between January and April. Occasionally nematodes may develop parthenogenetically. Staar has found that a chemical gradient does not influence the direction of movement of free larvae but small temperature differences have a considerable effect.

Sembdner spoke on the invasion of potato nematode larvae and their further development in plant tissues. It has been found that larvae invaded the roots of all the 85 species and varieties of Solanaceae studied, with the exception of some varieties of *Nicotiana tabacum.* No relationships existed between the hatching factors and the quantity of invading larvae in different plants. In some resistant *Solanum andigenum* hybrids, gall formations were found. Mention is also made of giant cell formation and defensive reactions noted in other plants.

In a meeting especially concerned with the use of *Solanum tuberosum* subsp. *andigenum* in breeding for nematode resistance, Toxopeus spoke on such work being carried out in Holland, reference being made to new biotypes of the parasite. Remarks were also made on resistance occurring in other *Solanum* species and the genetics of the resistance. K. H. Möller dealt with the situation as regards breeding for nematode resistance in the German Democratic Republic and the methods used. Difficulties have been found in combining nematode resistance with virus resistance; most of the hybrids bred for resistance to nematodes proved to be very susceptible to viruses. A large number of crosses have been studied and the best F_2 seedlings multiplied.

Jefremenko spoke of the spread of nematodes in parts of the USSR and of varietal trials for resistance which have been carried out; of 428 varieties and seedlings tested, all were heavily attacked except Voran.

Another session was concerned with the occurrence of aggressive biotypes. Howard reported on the situation in Great Britain where the existence of at least two biotypes has been proved. It appears that the different biotypes may pair with each other; also the hereditary factor responsible for overcoming resistance in the host is probably recessive to the factor responsible for the normal reaction. After raising three crops of resistant potatoes on an infected piece of ground hardly any further increase in the nematode population is found. Suggestions were made for an international system of nomenclature for nematode biotypes. Dunnett's contribution dealt with variation in the pathogenicity of potato nematodes and also the technique and results of testing wild species for resistance. *S. vernei* has been found free of cysts when tested with the Duddingston population of nematodes, this latter biotype being capable of overcoming the resistance of certain clones of *S. tuberosum* subsp. *andigenum.* A somewhat weaker resistance has also been found in other wild species of *Solanum*; it is suggested that breeding for resistance against aggressive biotypes should not be based solely on *S. vernei. S. demissum* is strongly attacked by the normal nematode population but only slightly affected by the Duddingston population, this difference being particularly marked in triploid material.

Schick reported on 280 tests carried out in 1958 on nematodes from 56 districts in Germany. Four populations were able to attack hybrid progeny of the clones CPC1673 and CPC1685 of *S. tuberosum* subsp. *andigenum* and also attacked one provenance type of *S. nigrum.* Other populations attacked the latter but not the *S. tuberosum* subsp. *andigenum* clones; two further populations attacked progeny of CPC1673 but not of CPC1685 or the previously mentioned form of *S. nigrum.* All the other populations showed normal nonaggressive behaviour. On *S. vernei* single cysts were found in a few cases. Following on from Howard's remarks, it was suggested that a collection of varieties be established for distinguishing between nematode biotypes and effecting further investigations on the differences between the races. Seeing that aggressive races in Germany appear to be confined to the Thuringian Forest, further breeding with *S. tuberosum* subsp. *andigenum* is considered to be worth carrying out in Germany.

In Goffart's paper, it was pointed out that no correlation exists between hatching activation and the severity of the attack. It is possible that the potato roots produce a substance which promotes the development of the larvae, development being inhibited in the absence of this compound. The single cysts which occasionally occur on resistant potatoes may be completely normal. Goffart is also of the opinion that breeding with *S. tuberosum* subsp. *andigenum* should be continued; it is quicker than breeding with the wild species and also by cultivating resistant plants descended from *S. tuberosum* subsp. *andigenum*, nematode populations are decreased more effectively than by the cultivation of any other nonsusceptible crop.

In a discussion following the reading of these papers it was decided that biotypes of nematodes should be designated by capital letters.

In the final session Rothacker spoke on breeding with *S. vernei* for nematode resistance. The mechanism of resistance in *S. vernei* probably differs from that of *S. tuberosum* subsp. *andigenum*. Crossing with *S. vernei* presents certain difficulties for this species has only 24 chromosomes; in this connection methods of obtaining hybrid forms of *S. vernei* with 48 chromosomes are described. It seems that the inheritance of resistance in *S. vernei* is under dominant polygenic control; the proportion of resistant plants was found to decrease with every back cross to susceptible forms but nevertheless in some F_2 generations up to 30% of the plants were resistant. One or two major genes and several modifiers probably control the resistance. *S. microdontum* also needs investigating as a possible source of resistance for breeding purposes.

Focke also spoke on the inheritance of nematode resistance in *S. vernei* and suggested that two dominant independent genes are probably involved.

Sculz and Roguski mentioned steps being taken in Poland to deal with the nematode problem.

In concluding the meeting, Kradel spoke on various measures which may hinder the spread of nematodes and referred to the importance of cooperation between breeders, pathologists and state officials concerned with plant protection.

1739 PRUMMEL, W.
Solanum nigrum L. als waardplant voor het aardappelcystenaaltje *Heterodera rostochiensis* Wollenw. **(*S. nigrum* L. as host plant for potato root eelworm, *H. rostochiensis* Wollenw.).**
Tijdschr. PlZiekt. 1958 : **64** : 142–43.

A Netherlands population of *H. rostochiensis* produced no cysts on a Netherlands variety of *S. nigrum* but gave rise to fully developed cysts with viable eggs and larvae on a variety from Mecklenburg, Germany.

1740 **(Awards for the development of a new potato variety).**
Kartofel' (Potato), Moskva 1958 : No. 3 : p. 59. [Russian].

Mention is made of awards to the breeders of Katjuša [Little Katja] (Jubel x Majka [May]), which was bred at the Nemešaevskaja Agricultural Research Station, Kiev province. This variety is characterized by high yield, good keeping quality, and resistance to *Phytophthora* and nematode.

1741 LANGELÜDDEKE, P.
Aphids as vectors of virus diseases of potatoes. A literature review.
Höfchen-Brief. Bayer PflSch.-Nachricht. 1957 : **10** : 237–66.

This survey includes a short section dealing with varietal differences of potatoes as regards aphid infestation. It is thought possible that aphids thrive best on those varieties which are highly resistant to viruses.

1742 MARCUS, O.
Über das Auftreten von Primärherden auf Blättern verschiedener Kartoffelsorten nach Beimpfung mit einem starken Y-Virus Stamm. **(On the development of primary foci on leaves of different potato varieties after inoculation with a severe strain of virus Y).**
Zbl. Bakt. 1958 : Abt. II : **111** : 197–203.

A strain of virus Y from a potato variety from Yugoslavia gave rise to marked primary lesions on 18 out of 33 varieties, indistinct foci on 11 varieties and none on the remaining four varieties Bella, Erstlinge, Toni and Uti. The hypersensitive reaction did not afford protection against systemic infection.

1743 JERMOLJEV, E.
Bramborový virus S. **(Potato virus S).**
Sborn. čsl. Acad. zeměd. Věd: Rada rostlinná Výroba 1958 : **31** : 421–28.

Ambra, Bintje, Erstling [First-Born], Jara [Spring], Triumf [Triumph], Kardinál [Cardinal], Keřkovské Rohlíčky [Keřkov Tip], Kotnov, Krasava, Mirka [Measure] and Rapid were free from the above virus among the approved varieties subjected to serological tests at Keřkov and Ruzyně.

1744 THIJN, G. A.
Aquila-nakomelingen. **(Aquila progenies).**
Zaadbelangen 1958 : **12** : 238–39.

An account of the history of the German variety Aquila, as far as it is known, is presented and varieties derived from it are listed. Its parentage is thought to include *Solanum edinense*, which in turn is probably derived from a cross of *S. demissum* with *S. tuberosum*. Aquila has been used in breeding many varieties, to most of which it has transmitted a high degree of resistance to leaf roll. Doré x Aquila is a promising combination under study at the Netherlands Plant Breeding Foundation.

1745 Rigot, N. & Mélard, V.
L'amélioration de la pomme de terre pour la résistance au virus de l'enroulement. (**Improvement of the potato in resistance to leaf-roll virus**).
Europ. Potato J. 1958 : **1** : No. 3 : 1–27.

A full account is presented of investigations carried out at Libramont, Belgium. The resistance to leaf roll of 171 commercial varieties and hybrids was observed under various conditions of infection. Most of the resistant varieties were descendants of wild species of *Solanum*. Interspecific hybrids from the Max-Planck Institute at Köln-Vogelsang, having *S. andigenum* or *S. acaule* in their pedigree, surpassed the cultivated varieties in resistance; back crossing these hybrids to cultivated varieties resulted in a considerable diminution in resistance.

Resistance to leaf roll is a polygenic character. There seems to be a factor responsible for resistance to infection in the foliage and another controlling transmission of the disease to the tubers; this latter factor probably influences virus multiplication. There are other genetic factors determining tolerance and sensitivity, the former being dominant to the latter. When hypersensitive tubers are infected, no plants are produced and the diseased stocks are eliminated. Hypersensitivity, combined with the factors for resistance in foliage and tubers, is thought to be a more valuable character than tolerance. The resistant variety Apta and some of the interspecific hybrids from the Max-Planck Institute have both the factors for hypersensitivity and for low susceptibility to leaf roll.

1746 Wiersema, H. T.
Onvatbaarheid voor het X-virus bij *Solanum andigenum*. (**Immunity from virus X in *S. andigenum***).
Tijdschr. PlZiekt. 1958 : **64** : 125–26. (Abst.).

At the Netherlands Plant Breeding Foundation, in the course of an attempt to combine the virus X immunity of a line derived from the USDA seedling 41956, which includes the Chilean variety Villaroela in its parentage, with the eelworm resistance of *S. andigenum* 'CPC1673', it was found that the latter is also immune from virus X and transmits immunity to its progeny; it is thought to be duplex for the character. Immunity is found also in other *S. andigenum* lines. The immune species *S. acaule* has been used in breeding but requires much back crossing to remove unfavourable characters.

1747 Rozendaal, A.
De betekenis van het M-virus voor de aardappel. (**The importance of virus M in the potato**).
Tijdschr. PlZiekt. 1958 : **64** : p. 126. (Abst.).

It is noted that Alpha and Bintje show little response to infection with virus M isolated in the Netherlands, while other varieties develop severe symptoms. Several strains of the virus have been isolated.

1748 Keller, E. R.
Betrachtungen zur Sortenfrage im Kartoffelbau. (**Reflections on the variety question in potato cultivation**).
Mitt. schweiz. Landw. 158 : **6** : 142–44.

Changes in the Swiss official list of potato varieties are discussed, reference being made to the difficulties in potato production caused by the occurrence of a strain of virus Y which in recent years has severely attacked some important potato varieties.

1749 Kameraz, A. Ju. & Ščerbakova, N. M.
(**Determining potato viruses S and X by means of serological "microreactions"**).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 11–15. [Russian].

Serological tests for the above viruses were carried out on many cultivars, interspecific hybrids and cultivated and wild species of the potato at the Institute of Plant Industry, and the results, together with an improved technique of microtesting, are described. It was found that all first generation seedlings of domestic varieties and multiple hybrids of *Solanum tuberosum* involving *S. commersonii*, *S. parodii* and other wild or cultivated species such as *S. rybinii* or *S. andigenum* were free from both viruses. The first tuber generations of the above material were also free from virus S, while virus X was identified in 9 clones out of a total of 50. In later tuber generations the incidence of the viruses became more frequent, and virus S was found in 64 domestic varieties out of a total of 80 investigated and virus X in 190 out of 230. The Soviet varieties Vyrapaevskij, Korenevskij and Ruslan have so far been free from virus S. Varieties which appeared to be free from virus X are being subjected to further tests. Data on the incidence of virus X in local varieties from Transcarpathia, introduced varieties from China, Norway and Finland and wild and cultivated species introduced from England are also presented.

1750 Strodov, V. F.
(Two crops in a year).
Kartofel' (Potato), Moskva 1958 : No. 3 : p. 58. [Russian].

Potato tubers dug in June were treated with a 1% thiourea solution and sown again for a second crop in the autumn at Odessa. Seedling 449/190, Hybrid 19/51 and Šuntukskij produced the most tubers under these conditions and Apatite and Hibiny 3/70 had the highest starch contents.

1751 Elmer, O. H.
The sweetpotato variety Kandee.
Rep. Kans. agric. Exp. Sta. 1958 : No. 9 : Pp. 4.

Kandee [(Yellow Yam x Nancy Hall) x Porto Rico] was released by the Kansas Agricultural Experiment Station in 1953. Its roots have orange flesh and a reddish-bronze skin, store well and are high in table and canning quality. The variety is highly susceptible to *Fusarium* stem rot, moderately susceptible to soil pox (*Streptomyces*), resistant to internal-cork virus and nematode and highly resistant to black rot. A mutant of Kandee possessing red-skinned roots is being grown under the name of Red Kandee.

1752 Cordner, H. B., Struble, F. B., Reder, R., Sorensen, H. B. & Morrison, L.
The origin and development of Nemagold sweet potato.
Bull. Okla. agric. Exp. Sta. 1958 : No. B–507 : Pp. 12.

Detailed information is given on the development and characteristics of Nemagold (Okla. 46), which is resistant to *Meloidogyne incognita* var. *acrita* [cf. XXIII, 2815].

1753 Sharma, A. K. & Datta, P. C.
Cytological investigations on the genus *Ipomoea* and its importance in the study of phylogeny.
Nucleus, Calcutta 1958 : **1** : No. 1 : 89–122.

Detailed cytological data on 24 species and varieties of *Ipomoea* collected in Calcutta are presented. The most frequent chromosome number was found to be $2n = 30$. On account of the considerable homogeneity between species as regards chromosome number and morphology, Hooker's inclusion of all the species in one genus is thought to be more natural than Engler and Prantl's classification of the species into different genera.

In relation to the cytological findings, the possible evolution of the genus *Ipomoea* is discussed. All present species have been derived from forms having $n = 14$ or $n = 15$.

1754 Wang, H. & Chien, C.-K.
(Studies on the effect of cutting back the vines on the foliage and tuber yields of sweet potato varieties).
Chung-hau Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 21 : 24–32. [Chinese].

Six varieties were studied under both summer and winter cultivation. The number of times the vines were cut back ranged from 0 to 4. In general, cutting back promoted foliage production and decreased tuber yield. However, significant variety x cutting-treatment interactions were noted.

1755 Martin, W. J.
Reaction of sweet potato varieties and seedlings to soil rot.
Phytopathology 1958 : **48** : 445–48.

A number of selections and breeding lines showed considerable resistance to soil rot (*Streptomyces ipomoeae*) while other entries, such as Heartogold and Acadian, possessed some degree of tolerance. The susceptibility of Unit 1 Porto Rico was marked.

FIBRES

1756 Neelakantan, L., Krishnamurthy, J., Rajagopalan, D. S. & Ramanujam, K.
Half a century of cotton research in Madras State.
Indian Cott. Gr. Rev. 1958 : **12** : 209–13.

Progress achieved as the result of breeding, genetical research and agronomic investigations is assessed.

1757 **What the scientists are doing? (i) D.C. 109—an outstanding *desi* cotton for the Punjab. (ii) Madras Cambodia Uganda number 2—a long staple cotton from Madras.**
Indian Cott. Gr. Rev. 1958 : **12** : 262–63.

DC109 (231 Rosea) has yielded 1616 lb. seed cotton per acre and has a ginning outturn of 41·2%, fibre length of 0·97 in. and spinning capacity of 23 HSW counts, whereas the corresponding figures for the standard strain M60–A2 are 1461, 38·5, 0·68 and 6. Derived from crosses involving Madras Cambodia and Uganda and Sea Island introductions, MCU–2 has a ginning outturn of 34% and staple length of $1\frac{1}{32}$ to $1\frac{1}{16}$ in.

and is suitable for spinning 36 to 38s with a count strength product of 1797 at 30s and 1591 at 40s. Capable of maturing within 5–5½ months, it is particularly suitable for the summer-cropped area where rice is sown in rotation with cotton. [Cf. XXVIII, 1847].

1758 Zakirov, K. Z.
(The most important aims of agricultural science in cotton growing).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. **3** : 31–42. [Russian].

An extended account of a report already summarized is given [XXVIII, 4427].

1759 Cotton, J. R., Wood, R. L. & Staten, G.
Variety tests of American Upland cotton in New Mexico.
Bull. N. Mex. agric. Exp. Sta. 1958 : No. 423 : Pp. 14.

Data are given on the performance of Acala and other strains tested during 1951–57. Acala 1517C is recommended for all the chief cotton-growing areas of New Mexico. A new Acala 1517C strain (8893) has stronger stalks, greater tolerance of *Verticillium* wilt and 8% higher yielding capacity than the original Acala 1517C (7133). On account of its higher yield, the bacterial-blight resistant strain Acala 1517BR–1 is expected to replace the older blight-resistant strain Acala 1517BR [cf. 1774].

1760 Muramoto, H.
The genetic combining ability of certain varieties of *Gossypium hirsutum* as measured for agronomic and spinning qualities.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2668 : 204–05. (Abst.).

Specific combining ability was investigated at the University of Arizona in crosses of Acala 44 as ♀ with Coker 100W, Empire, Acala 4–42, Acala 68, Greek G–2, D & PL Fox and Meade. The following characters were measured in the F_1: (1) yield of seed cotton, (2) boll size, (3) lint percentage, (4) lint index, (5) seed index, (6) number of seeds per boll, (7) fibre fineness, (8) length and (9) strength. Hybrids from high combiners were definitely superior to the parents in (1) for two consecutive years. Heterosis was shown in (3), (4) and (6). No consistent heterotic effects were noted in the case of the remaining five characters. The spinning properties of the F_1s were acceptable in each cross. Heritability estimates were high for (2), (3), (4) and (7), the average values for the seven crosses being 64·3, 46·6, 60·8 and 65·8% respectively. All the other characters varied considerably in heritability values. Average break factor was highly correlated with (8) and (9). Crosses showing high combining ability were those with Coker 100W, Empire, Acala 4–42 and Acala 68. The remaining crosses were low in combining ability. With respect to (1), the results from top crosses of the F_1s with Meade as ♂ corresponded with those from the tests of specific combining ability. Early screening for high combining ability is therefore justified.

1761 Pandya, P. S. & Patel, C. T.
Review of further progress in interspecific hybridization work at Surat.
Indian Cott. Gr. Rev. 1958 : **12** : 214–20.

The results so far obtained by using *Gossypium anomalum*, *G. armourianum* and perennial American types as parents and by hybridization of *inter se* derivatives of crosses between Asiatic and American varieties are reviewed [cf. XXVIII, 1847]. In selecting for yield and other characters in (1) 5*x* back crosses of doubled (*G. hirsutum* 'G2' x *G. anomalum*) to Co.2 and (2) outcrosses of the *G. hirsutum* x *G. anomalum* hexaploid and of the back-cross pentaploids to other *G. hirsutum* types and *G. barbadense*, fibre fineness and strength derived from the wild species have undergone gradual reduction. Some cultures promising with respect to ginning outturn and other technological properties have however been obtained. From [6*x* (Co. 2 x *G. herbaceum* 1027ALF) x *G. armourianum*] x Co.2, a strain has been isolated with the characters of healthy growth of the foliage, round bolls and long peduncles, conferred by the wild parent. Low in yield capacity and possessing a ginning outturn of only 26% and fibre length of about 1 in., the strain has been crossed with extra-long-stapled Indo-American types. An attempt has been made to improve *G. hirsutum* with respect to depth of root system and adaptability by crossing with the perennial American types Exotic 3 and YS. The material thus secured includes a number of promising F_6 cultures of 134–Co.2–M x (Exotic 3 x Acala 8) and BC68 x (Exotic 3 x Acala 8). A number of the cultures from intercrosses of Indo-American cottons developed by interspecific hybridization are listed as promising with respect to yield, ginning percentage and halo and fibre lengths. A few cultures of Indo-American derivatives have shown jassid and black-arm resistance and are undergoing further testing of economic characters.

1762 AL-JIBOURI, H. A., MILLER, P. A. & ROBINSON, H. F.
Genotypic and environmental variances and covariances in an Upland cotton cross of interspecific origin.
Agron. J. 1958 : **50** : 633–36.

The cross studied was Empire 10 x TH131–5. Empire 10 is a strain of a *Gossypium hirsutum* variety; it is well adapted to the southeastern cotton-producing areas of America. TH131–5 is a low-yielding strain resulting from six recurrent crosses of a trispecific hybrid to Upland varieties, coupled with selection for high lint strength. The trispecific hybrid was the result of crossing an allotetraploid hybrid between *G. thurberi* and *G. arboreum* with tetraploid *G. hirsutum*. A population of 92 randomly chosen F_3 progenies from the cross Empire 10 x TH131–5 was grown in 3 replications in Rocky Mount and Clayton, NC. Eight characters affecting yield and fibre quality were investigated. Most of the phenotypic variance among progeny means was attributable to genotypic effects ranging from 59% for lint yield to 90% for lint percentage and lint strength. Progeny x environment interaction variances made up small proportions of the total phenotypic variances, ranging from 1% for lint strength to 16% for yield. Plot error variances ranged from 8% of the total variance for lint percentage up to 25% for lint yield. There was a high positive correlation between lint yield and lint percentage and there was a strong negative relationship between these two traits and fibre strength. Neither fibre length nor fibre fineness showed substantial correlation with yield, lint percentage or fibre strength.

Predicted effects of selection indicated that it would be difficult to combine high yield and lint percentage with high fibre tensile strength in this population. Possible explanations of such restrictions on character combinations are discussed. It is thought that it would be almost impossible to obtain the desired combinations if pleiotropic effects are mainly responsible for the combination of high fibre strength with low yield. However linkage may be responsible for the undesirable combination; in this connexion, methods of breaking the linkage and selecting for the desired character combination are considered.

1763 SARVELLA, P.
Cytomixis and the loss of chromosomes in meiotic and somatic cells of *Gossypium*.
Cytologia, Tokyo 1958 : **23** : 14–24.

As already briefly reported, the author has observed that cytomixis occurs in PMCs of species and hybrids [XXVII, 3214]. It is suggested that cytomixis in *Gossypium* may be responsible for binucleate cells, PMCs with reduced or increased numbers of chromosomes and somatic loss of chromosomes.

1764 BORISOV, G. N.
(New promising varieties in cotton).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 4 : 40–44. [Russian].

Descriptions are given of two new varieties from the Cotton Research Station of the Tajik Agricultural Institute, four from the Central Breeding Station of the Cotton Institute and some other recent selections which have already been described [XXVII, 715]. The new varieties 5230V and 5010V are productive, fine-fibred midseason types. The former outyields 5904I, ripens earlier and produces fibre of superior quality; the latter is superior in yield and ginning percentage to 504V and is moderate in its moisture requirements. S6002 is another fine-fibred variety; it has double the yield of 5476I and shows improved resistance to *Fusarium* wilt, besides having larger bolls and a higher ginning percentage. S1622 (S1225 x 108F), S1581 (S1209 x S460) and S4727 (137F x S1470) are all midseason types with similar properties to 108F but more productive. S1581 and S1622 have a habit suitable for combine harvesting, the latter variety having a lint length of 34–34 mm. S4727 has larger bolls and is earlier than 108F.

1765 STEPHENS, S. G.
Factors affecting seed dispersal in *Gossypium* and their possible evolutionary significance.
Tech. Bull. NC agric. Exp. Sta. 1958 : No. 131 : Pp. 32.

Taxonomic and morphological studies of commensal, wild, cultivated and hybrid forms of *Gossypium* are reviewed and discussed, special emphasis being laid on those seed characters which would have been involved in the transition from the wild to the cultivated habit. Certain characteristics which are desirable in cultivated forms, among others fluffing lint hairs, widely opening bolls and easily removed lint hairs, place the plants at a strong selective disadvantage compared with wild forms. Of the possible sequences in which the three steps involving the development of an open boll, fluffy fibre and nonadherent fibre can have taken place during the evolution of wild diploid cottons to cultivated forms, the order given is regarded as the most probable, since the first two steps in the sequence could occur as simple mutants and would not inhibit seed dispersal. At this stage the wild form would be attractive to man and the third step would be encouraged by continuous human selection. If the amphidiploid cultivated cottons are derived from wild x wild crosses, then the sequence of evolutionary steps for them is probably the same as for the diploids, since synthetic amphidiploids of this type have the same three wild characters. If, however, they derive from crosses between a cultivated Asiatic and a wild American diploid species, then the expression of the cultivated characters in the hybrid would presumably depend upon gene interaction. The paper concludes with a discussion of the hypothesis that "in cotton the combination of non-flaring capsule and adherent undifferentiated fibre is a primitive characteristic which is found in all or nearly all wild species and is never found in either wild or cultivated members of the cultivated species. The combination of widely flaring capsule and nonadherent convoluted lint is never primitive, and its presence in a wild form may be considered as strong evidence that the form is derived from previously cultivated ancestors."

1766 KAMRA, O. P.

Effects of polyploidy on cotton fibers.

Agron. J. 1958 : **50** : 497–99.

Colchicine-induced polyploids of inbred strains of Old and New World cottons and of an interspecific F_1 hybrid showed slow development and considerable alterations in morphological characters, an increase in pollen grain diameter and a reduction in fertility being noted. Boll size increased in autotetraploids of *Gossypium herbaceum* race *persicum* and *G. arboreum* strain *sanguineum* and their F_1 hybrid. Boll and seed size of the octoploids of *G. hirsutum* strain Coker 100 wilt and *G. barbadense* strain Pima 32 was more variable but the means were lower.

Fibre perimeters, determined by means of an arealometer, were significantly increased in tetraploids of *G. arboreum* strain *sanguineum* and *G. herbaceum* race *persicum* as compared with the diploids. In octoploids of *G. hirsutum* strain Coker 100 wilt, no corresponding increase was noted; this may have been due to the plants being chimeras. The octoploids of the Pima strain showed a considerable increase in fibre perimeter over that of the tetraploids. The X-ray angles of the cellulose fibrils were also measured; the smaller the angle the more nearly parallel are the fibrils to the long axis of the fibre. In the Old World tetraploids, the X-ray angles increased in about the same proportion as the fibre perimeters, indicating that polyploidy increased fibre thickness but not the length of the helix in which the cellulose fibrils are deposited.

Leaf and seed epidermis in some of the chimeras were derived from the same cell layers but in others they came from different layers.

1767 ARUTJUNOVA, L. G.

(The effect of emasculation upon the setting of cotton seed and bolls).

Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci. 1958 : No. 4 : 33–39. [Russian].

Physiological causes for the reduction in the growth of the pollen tubes and in the development of bolls and seed from emasculated flowers of cotton were studied at the Central Breeding Station of the Cotton Institute. It was found that emasculation impeded the respiration, this effect being attributed to the removal of the carotinoids, vitamins and carbohydrates present in the flower.

The depressive effects of emasculation were mitigated by removing the stamens only and as late as possible, i.e. on the morning of anthesis. Pollinating the flowers with pollen mixtures of self pollen and pollen of other varieties or other plants of the same variety also reduced the depressive effect of emasculation, in particular by stimulating the physiological activity of the pistil.

1768 **Chemicals and plant processes.**

J. Agric. Food Chem. 1958 : **6** : 719–20.

In the Symposium on Control of Physiological Processes in Plants by Chemicals presented at the American Chemical Society National meeting in Chicago, September 1958, sodium α,β-dichloroisobutyrate was mentioned as being of possible use in the production of hybrid cotton seed. When this chemical is applied to the flowers, these become male sterile, whilst retaining full female fertility.

1769 OMEL'ČENKO, M. V.

(Growth and development of cotton plants from embryos of different ages).

Agrobiologija (Agrobiology) 1958 : No. 2 : 136–39. [Russian].

Observations on 1306, 108F and S460 plants, sown with seed extracted from the bolls at various dates before they had reached maturity, showed that growth and development were retarded and that they formed the first fruiting branches higher up the stems than the controls. Some of the experimental plants attained a greater height at the end of the growth period and formed larger numbers of monopodial branches, ovaries and fruits. Some forms of 108F with a sturdy habit and many fruiting laterals have been selected.

1770 NAYAR, K. V. N.
Progress in the improvement of quality of *desi* cottons of Madhya Bharat.
Indian Cott. Gr. Rev. 1958 : **12** : 224–28.

This review is based on data on the fibre properties and spinning value of cottons studied in varietal trials during the past 25 years. Varieties available 25 years ago had a fibre length of about 0·72 in., as against present-day types with 0·85 in. Fineness has been improved by 15%, while spinning value has risen from 12 to 26 HSW counts.

1771 FILIPPENKO, G. I., BESEDIN, P. N. & STRAUMAN, B. P.
(The breeding and seed production of cotton).
Bjull. naučn.-teh. Inform. Sojuz NIHI (Bull. sci.-tec. Inform. All-Un. Cott. sci.-res. Inst.) 1957 : No. 2 : 7–13. [Russian].

An account of breeding research with cotton, together with a description of the Mičurinist and other breeding techniques employed and the varieties thus obtained, is presented. The results include many varieties characterized by earliness, fineness of fibre, high yields and ginning percentages, large bolls and resistance to *Verticillium, Fusarium* or *Xanthomonas*.

1772 MOHAMMAD FASAHAT ALI KHAN & MAJID, S. A.
Application of test tube method for determination of oil content in cottonseed.
Pakist. Cott. 1958 : **2** : No. **4** : 18–29.

Modifications have been made in a method of determining oil content devised by Wahab and Fateh Muhammad, involving filtration of samples treated with petroleum ether [XXVI, 2628]. The standardized method thus devised has been successfully applied to breeding material and named varieties. The results obtained indicate that considerable scope exists for developing cotton high in oil production.

1773 SAHASRABUDHE, V. B. & KHARGONKAR, S. A.
Response to selection for staple length in fifteen generations of *arboreum* cotton crosses.
Indian Cott. Gr. Rev. 1958 : **12** : 229–32.

Selection in successive generations of six crosses, based on the mean value for halo length, resulted in increasing the halo length in the F_9 by 27–43% of the initial F_3 values. Rates of increase in mean halo length from the F_8 to F_{15} were determined by fitting second degree polynomial curves to the deviations of mean values from parental means in order to eliminate the seasonal effect. The six crosses were thus found to differ in potentiality for selection. It was however concluded that progress in selection for halo length generally comes to an end after the F_9 or F_{10}.

1774 ADAMS, J. D. & WOOD, R. L.
Acala 1517BR-1, a new bacterial blight resistant strain of cotton.
Res. Rep. N. Mex. agric. Exp. Sta. 1958 : No. 16 : Pp. 7.

Acala 1517BR–1 shows a number of improvements in agronomic and technological properties in comparison with its parents, Acala 1517BR (blight resistant) and Acala 1517C. It is however less tolerant of *Verticillium* wilt than Acala 1517C.

1775 LAST, F. T.
Stem infection of cotton by *Xanthomonas malvacearum* (E. F. Sm.) Dowson.
Ann. appl. Biol. 1958 : **46** : 321–35.

Investigations were carried out at the Gezira Research Station, Sudan, to determine the effects of position of inoculation, concentration of inoculum, age of the plant and variety on reaction to stem infection with *X. malvacearum*. Of the genes for resistance to primary leaf infection, only B_{6m} combined with other *B* genes conferred an appreciable degree of resistance to stem infection. Varieties containing B_{6m} only were not available for testing.

1776 KALYANASUNDARAM, R. & BRAUN, R.
Über die Probleme der Baumwollwelke.
(The problems of cotton wilt).
Phytopath. Z. 1958 : **33** : 321–40.

A survey is presented of the information on *Fusarium* wilt obtained through studies carried out in India during the past 10 years; the reactions of resistant and susceptible hosts are discussed.

1777 JOHNSON, L. F. & EPPS, J. M.
Radiation tests look to wilt-resistant cotton.
Tenn. Fm. Home Sci. 1957 : No. 23 : p. 4.

At the Agricultural Experiment Station, University of Tennessee, an attempt to induce mutation for resistance to *Verticillium* wilt by radiation has been initiated, with treatment of seeds of Deltapine 15 with γ rays.

1778 Borodič, Z. N.
(The fibre-flax variety L1120 and methods of research with this variety).
Lën i Konoplja (Flax & Hemp) 1958 : No. 4 : 42–45. [Russian].

The breeding history of the above standard variety from Smolensk, distinguished by lodging resistance and high seed and fibre yields, is described. Mention is made of recent trials in which it has yielded more seed, and more long and short fibres than 1288_{12}.

1779 Potočanac, J.
Svojstva sjemena i karakteristike rasta mladih biljaka domaćih lanova u stadiju nicanja i busanja. **(Seed properties and growth characteristics of young plants of home-grown flax varieties in the shooting and tillering stages).**
Poljopr. Znanst. Smot. 1957 : **16** : 223–44.

Linum usitatissimum var. *bienne* had a 1000-seed weight varying between 4·62 and 6·1 g., corresponding values for *L. usitatissimum* var. *vulgare* and var. *crepitans* being 3·9–5·57 and 3·45–4·9. The first mentioned variety had the largest seed. Observations are also reported on the size of the cotyledons of these varieties and on their root and stem development. *L. usitatissimum* var. *bienne* may be distinguished from the other two varieties after 30–40 days development, on account of its different growth habit.

1780 Potočanac, J.
Sadržina tehničkog vlakna i ulja kod domaćih lanova iz Hrvatske i Bosne. **(The content of industrial fibre and oil of land varieties of flax from Croatia and Bosnia).**
Poljopr. Znanst. Smot. 1957 : **16** : 191–204.

It was found that the spring flaxes, *Linum usitatissimum* var. *vulgare* and var. *crepitans*, had higher percentages of fibre in their stems than the winter flax *L. usitatissimum* var. *bienne*; ecotypes within each variety also differed markedly in respect of fibre content. Such differences were in many cases genetically inherited. The winter flax variety was more productive than the other two varieties because it gave a greater yield of stem; for the same reason, *L. usitatissimum* var. *vulgare* was more productive than *L. usitatissimum* var. *crepitans*. The seed of the winter flax variety had the highest oil content, this being 41·25%; the winter variety also produced bigger seed than the others. As regards oil production, the two spring varieties were similar. In all three varieties, ecotypes differing in oil content were found. Both fibre and oil production were greatly influenced by environment.

1781 Potočanac, J.
Vlakneni snopovi i vlaknene stanice od domaćih lanova iz Hrvatske i Bosne. **(Fibre bundles and fibre cells of land varieties of flax from Croatia and Bosnia).**
Poljpor. Znanst. Smot. 1957 : **16** : 205–21.

Observations are reported on the size, form and position of the fibre bundles in *Linum usitatissimum* var. *bienne*, var. *vulgare* and var. *crepitans*. Considerable variability within varieties was found in the size of bundles and fibre cells and in the number of fibre cells in a bundle; some of this variability was of a genetic nature. When cross sections of stems of similar thickness were compared, a greater area of bundle tissue was observed in the winter flax (var. *bienne*) than in the other two varieties; the winter variety had bigger fibre cells and a greater number of fibre cells per bundle. Also the summer flax, *L. usitatissimum* var. *vulgare*, had more fibre cells per bundle than the spring flax, *L. usitatissimum* var. *crepitans*.

These genetically controlled differences between the varieties influence the technological properties of the fibre produced. The winter flax has the coarsest fibre of the three varieties, not only on account of the greater size of the fibre bundles but also because they tend to hold together when the fibre is being prepared. Selection for smaller bundles would result in the development of a variety producing a fine fibre.

1782 Houston, B. R., Knowles, P. F. & Ashworth, L. J.
The determination of pathogenic races of *Fusarium oxysporum* f. *lini*.
Phytopathology 1958 : **48** : p. 394. (Abst.).

Five races were identified by their differential pathogenicity on six pure lines of flax derived from selections of Punjab 47 and 53, Dakota and Argentine. "Three of the 5 races could be separated on the basis of the presence or absence of 1 or more of the 3 genes (A, B and C) for resistance previously reported. The complementary action of these 3 genes in the dominant is necessary for resistance to certain races."

1783 Petrahilev, I. M.
(Interspecific hybrids of hemp).
Priroda (Nature), Leningrad 1958 : No. 10 : 102–04. [Russian].

A winter-hardy, drought-resistant hybrid with tall stems is recommended for advanced trial or as breeding material. It was obtained in the following manner. First a cultivar originating from central Russia was fertilized by the pollen of wild Siberian hemp. The hybrids were then grown in altered environments, first at Vladimir and later at Murom, the intention being to weaken the dominance of the wild parent. However, this being of no avail, the hybrid was again crossed with a cultivar, Mestnaja Gor'kovskaja [Gor'kij Local], the latter serving as ♀ parent. The progeny from the cross resembles the cultivar and has double the 1000-seed weight of its ♂ parent, which is characterized by rather small seed.

1784 BÒCSA [BÓCSA], I.
Nuovi metodi e risultati nel miglioramento genetico della canapa. **(New methods and results in the genetic improvement of hemp).**
Sementi elette 1958 : **4** : No. 2 : 28–35.

A Chinese hemp was pollinated with four different Hungarian varieties, the male flowers being removed from the Chinese parent. All four hybrids were distinguished by great vigour, that from Kompolt being the best in respect of yield of stem and of fibre; in the years 1953–56 it yielded 18% more than Chinese and 20% more than Kompolt. In view of these figures the hybrid was recommended in 1954 for extensive cultivation in Hungary under the designation B–7. A more recent hybrid, using a later maturing Chinese hemp as seed parent, has given still higher yields, exceeding those of B–7 by 20–25%, but is somewhat too late in maturity for Hungarian conditions.

Different parental combinations of the same two varieties might vary in the yield of their F_1 and also in the degree of reduction in vigour in the F_2 and succeeding generations. Some F_2 populations have given yields equal to those of the F_1 and further attention is being given to these as a possible source of commercial seed.

Some tetraploids have been produced in the hope of developing an exclusively female form for use in the production of triploid hybrids.

1785 BÓCSA, I.
A kender beltenyésztésének újabb jelenségei. **(New phenomena in hemp inbreeding).**
Növénytermelés 1958 : **7** : 1–10.

Inbreeding in a monecious line developed at Kompolt, Hungary, resulted in a decrease in the vegetative period in segregating male and female individuals compared with noninbred controls. Some female plants showed certain male characters, together with a low 1000-seed weight and a tendency towards parthenocarpy. After five years of inbreeding, the monecious lines showed a decrease in height to 68% of the noninbred diecious controls, a diminution in leaf area, both number and size of leaflets being reduced, occasional partial sterility, a reduction in crop yield and an increase in susceptibility to *Septoria cannabina.*

1786 ZORIN, M. A. & GORŠKOV, P. A.
(Hemp production in Jugoslavia).
Lën i Konoplja (Flax & Hemp) 1958 : No. 3 : 45–48. [Russian].

Mention is made of Novi Sad (Fleischmann x Mestnaja Bačkovskaja [Local Bačkovskaja]), recently bred at the Jugoslav Institute of Plant Industry. It has taller stems and a shorter growth period than the commonly grown Leskovačka.

1787 JOYNER, J. F. & PATE, J. B.
The inheritance of petal spot in kenaf.
J. Hered. 1958 : **49** : p. 152.

The purple petal spot of BG–52–29 (line of Salvadorian) was dominant to the absence of such a spot in PI209231 and dependent on a single gene. An association was detected between anthocyanin production in the flowers, stems and petioles.

1788 MEDVEDEV, P. F.
(On the economic and biological significance of diecious specimens of *Urtica dioica* L.).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1704–07. [Russian].

A study of various geographical races of *U. dioica* revealed differences in the proportion of male to female individuals; the proportion varied from 1 : 2 to 3 : 1, being highest in areas where conditions for pollination were least favourable. The male plants were higher in content and quality of fibre. The fibre content was higher in *U. platyphylla* than in *U. dioica.*

1789 OLAH, L. v.
The cytology of *Corypha umbraculifera* L. Part I. Meiosis.
Ann. bogor. 1954 : **1** : 201–37.

OLAH, L. v.
The cytology of *Corypha umbraculifera* L. Part II. The behaviour of the nucleoli and the role of the nucleolar organizing region.
Ibid. 1956 : **2** : 149–73.

Meiosis in pollen mother cells of *C. umbraculifera*

($2n = 18$) is characterized by the occurrence of nucleolar budding at leptozygotene and of the appearance of a Feulgen-positive substance in the nucleolar organizing region during zygotene. This substance is matrix-like and semiliquid and contains DNA and at the time of condensation of the chromosomes disappears, suggesting that it may play a part in matrix formation.

1790 **Promising new fiber crop for cordage.**
Crops & Soils 1958 : **11** : No. 3 : p. 9.

Attention is drawn to a rapidly growing *Sansevieria* hybrid, referred to as a "cross between variegated flat-leaf and round-leaf species". It has given outstandingly high yields on muck soils in Florida, where it may make annual harvests before December or January practicable.

1791 Nishiyama, I. & Watanabe, T.
(Studies on artificial polyploid plants. XX. On artificial polyploids of *Edgeworthia papyrifera*).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 75–82. [Japanese].

A comparative study of the plant characteristics and cytology of diploid ($2n = 36$), colchicine-induced tetraploid and triploid strains is reported. Multiple chromosome associations were noted in both the $2n$ and $4n$ strains, while in the triploids up to 27 bivalents were formed; it thus appears that the $2n$ strain is autotetraploid. Both the $3n$ and $4n$ strains were superior to the $2n$ forms in respect of fibre length. The $3n$ forms are fertile and are regarded as promising for future breeding.

SUGAR AND STARCH PLANTS

1792 Wiehe, P. O.
Rapport annuel de l'Institut de Recherches Sucrières pour 1957.
(Annual Report of the Sugar Research Institute for 1957).
Rev. agric. sucr. Maurice 1958 : **37** : 72–114.

This is a shortened French version of a report already summarized [XXVIII, 4485–4487].

1793 Matherne, R. J. & Hebert, L. P.
Results of sugarcane variety tests in Louisiana during 1957.
Sug. Bull., N. Orleans 1958 : **36** : 270–83.

The results of comparisons of commercial and unreleased varieties with respect to cane and sugar yields are summarized. The new variety CP52–68 is considered to be promising as a cane suitable for light and heavy soils and gives a somewhat higher sugar yield per ton of cane than CP44–101.

1794 Stafford, T. J.
Outfield sugarcane variety trials—1957.
Sug. Bull., N. Orleans 1958 : **36** : 313–30.
1958 sugarcane variety recommendations for Louisiana.
Ibid. 1958 : **36** : 331–32.

A report is given of the results of tests of commercial and experimental canes in Louisiana.

1795 **The Taiwan sugar industry release new varieties bred in Taiwan, F141, F142, F143 and F144.**
Taiwan Sug. 1958 : **5** : No. 8 : 13–15.

A poor ratooner, F141 (PT46–150 x PT43–52), is recommended as a plant cane on good soils with irrigation. F142 (N:Co.310 x EK327) is superior to N:Co.310 in both ratooning ability and sucrose content. F143 [F135 x 37–1423 (Co.331 x F85)] has outyielded N:Co.310 in many trials, even on extremely heavy soils, and ratoons well. As a plant cane, F144 (N:Co.310 x PT47–1079) has outyielded N:Co.310 only on the more fertile soils. As a ratooner, it is somewhat better than this standard. F141 and F143 are inferior and F144 equal to N:Co.310 in sucrose content. The four varieties are resistant to the chief diseases in Taiwan, except for the susceptibility of F141 to downy mildew and of F144 to one strain of mosaic.

1796 Story, C. G.
The new varieties Q.63 and Q.65.
Cane Gr. quart. Bull. 1958 : **22** : 9–11.

The sugar cane Q63 (Trojan x CP29/116) may be harvested throughout the season while Q65 (POJ2878 x Co.290) is suitable only for late harvesting. The former variety is adapted to a wide range of soils, whereas the latter has given its best results on medium and better-class soils in the Mackay and Proserpine areas. Both varieties have remained free from red rot and not been unduly affected by ratoon stunting. Either is suitable as a substitute for Q50.

1797 Guilbeau, W. F., Coll, E. E. & Martin, L. F.
Processing of new commercial and unreleased sugarcane in comparison with the standard commercial cane in pilot plant clarifications.
Sug. Bull., N. Orleans 1958 : **37** : 29–42.

A report is given of the results of pilot-plant clarifications of (1) stubble cane of the recently released commercial canes CP48/103, CP47/193 and N:Co.310 and of the standard CP44/101, and (2) plant cane of the unreleased varieties CP52/57, CP52/67 and CP52/68 and of the standard CP44/101. All the varieties gave satisfactory extractions.

1798 LAUDEN, L. L.
Louisiana gets a new cane variety, C.P. 52-68.
Sug. Bull., N. Orleans 1958 : **36** : p. 256.
Release of C.P. 52-68.
Ibid. 1958 : **36** : p. 258.

The Louisiana Agricultural Experiment Station, the US Department of Agriculture and the American Sugar Cane League jointly announce the release of this new variety which is distinguished by its adaptation to light and heavy soils and high yields of sugar per ton of cane. It is vigorous, grows erect and is moderately resistant to red rot, resistant to root rot and tolerant of stunting disease, although heat treatment is recommended. It has remained free of mosaic at many test stations but is severely injured if infection does occur. It is more susceptible to cold injury than N.Co.310 or CP44–101 and resembles the latter variety in milling characters. Details of its origin are not supplied.

1799 TSENG, P.-M. & LOH [LO], C.-S.
(**Studies on the growth in length of the sugar cane. II. The length and diameter of the canes and factors connected with them**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 22 : 5–26. [Chinese].

A detailed study of cane dimensions in a series of varieties grown in Taiwan is reported. Two types of cane are distinguished: (1) the common type, in which the diameter varies only slightly along the cane; and (2) a type in which the diameter decreases towards the apex, exemplified by PT51–11. Information is provided on the length, diameter, number of internodes and length of internodes of primary, secondary and tertiary stalks at various stages in the life cycle and under various environmental conditions for each of the varieties investigated.

1800 HU, T.-H. & LEE [LI], S.
(**Photoperiodic experiments on induction of flowering in sugar cane. I**).
Tai-wan Tang-yeh Shih-yen-so Yen-chiu Hui-yen/Rep. Taiwan Sug. Exp. Sta. 1957 : No. 16 : 22–36. [Chinese].

Six varieties which normally fail to flower in Taiwan were used. They were subjected to 12-hr. days or to an initial photoperiod of 12 hr. 30 min. decreasing thereafter by 1 min. a day. The effects of normal and increased night temperatures were investigated, also the effect of the above treatments at different times in the year. Each of the photoperiodic treatments proved useful in inducing flowering in some cases and the effect of increasing night temperature was also beneficial.

1801 LI, L.-H., CHOU, L.-H., TSAI, Y.-C. & LI, I.-L.
(**The effects of checking the mother shoot or earthing up on the yield of sugar cane**).
Tai-wan Tang-yeh Shih-yen-so Yen chiu Hui-yen/Rep. Taiwan Sug. Exp. Sta. 1957 : No. 16 : 49–61. [Chinese].

Both the above treatments were in general deleterious when applied to a series of commonly grown Taiwan varieties. However, the earthing-up treatment, which spreads the stool, brought about an increase in sugar yield in feebly tillering varieties such as F108.

1802 AMBIKA SINGH & BALJIT SINGH
Nitrogen content and yield of some sugarcane varieties.
Curr. Sci. 1958 : **27** : 393–94.

An inverse relationship between N content and yield was found for the five varieties studied, viz. Co. 453, Co. 997, Co. 617, Co. 957 and Co. 313. As this result has a significant bearing on selection at the early stages, the relationship between the two properties is to be further investigated in a large number of varieties at the Indian Institute of Sugarcane Research, Lucknow.

1803 YANG, C. S.
(**A preliminary report on competitive ability in sugar-cane varieties and its connexion with yield**).
Tai-wan Tang-yeh Shih-yen-so Yen-chiu Hui-yen/Rep. Taiwan Sug. Exp. Sta. 1957 : No. 16 : 37–48. [Chinese].

The relative performance of five varieties was studied when (1) grown singly with one variety to a hill and (2) when grown in bunches according to the Hawaiian method and therefore subjected to competitive pressure. It was found that the relative performance of the varieties was similar whether singly or bunch planted. It therefore appears that yielding capacity and competitive ability are correlated.

1804 CHU, T.-L. & BAU, Y.-S.
Resistance trials for downy mildew disease in Taiwan.
Taiwan Sug. 1958 : **5** : No. 9 : 13–20.

In trials carried out in northern Taiwan to study the reaction of promising seedlings, commercial varieties, varieties used in breeding and relatives of the sugar cane to *Sclerospora sacchari*, many entries showed a high degree of resistance, including N:Co.310 which occupies 95% of the sugar-cane acreage in Taiwan.

1805 Chu, T.-L., Liu, H.-P. & Lo, H.-C.
(Testing sugar cane variety for resistance to *Sclerospora sacchari*).
Tai-wan Tang-yeh Shih-yen-so Yen-chiu Hui-yen/Rep. Taiwan Sug. Exp. Sta. 1957 : No. 16 : 1–21. [Chinese].

An extensive trial of cultivated varieties, wild *Saccharum* species and some related genera for resistance to the above pathogen was made at Shinchu in northern Taiwan. *S. spontaneum*, *Narenga*, *Miscanthus* and *Erianthus* were not infected and a high degree of resistance was found in many cultivated varieties, in particular in the widely grown clone N:Co. 310.

1806 Wang, C.-S. & Wang, M.-S.
(Studies on *Sclerospora sacchari*).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1958 : No. 22 : 51–62. [Chinese].

Included in this study is an account of varietal variation in a series of PT clones in respect of decline in Brix after infection with the above pathogen.

1807 Ruinard, J.
Onderzoekingen omtrent levenswijze, economische betekenis en bestrijdingsmogelijkheden der stengelboorders van het suikerriet op Java. **(Investigations on the biology, economic importance and possibilities of control of sugar cane stalk borers in Java).**
Proefschr. LandbHoogesch. Wageningen 1958 : Pp. 222.

It is noted that under similar conditions during 1954–57, 3016 POJ was more severely attacked than 2878 POJ, 2967 POJ or 3067 POJ. No significant differences in attack were detected among the last three clones.

1808 Patel, P. L., Patel, R. M. & Patel, R. A.
S.1049—an improved type of forage sorghum.
Bull. Inst. Agric. Anand 1955 : No. 2 : Pp. 12.

Selected from the local sweet sorghum grown in North Gujarat, S1049 shows improvement with respect to forage yield, yield and size of grain, early maturity, tillering capacity, fineness of stem and nutritive value of the dry forage.

1809 Lenger, A.
Analyse d'un essai factoriel sur la betterave sucrière par la méthode des surfaces de réponse. **(Analysis of a factorial trial of sugar beet by the response-surface method).**
Publ. Inst. belge Amélior. Better. 1957 : **25** : 267–302.

The effects of 4 varieties, 4 levels of nitrogen and 3 harvesting periods on yield of roots, top and sugar were analysed by the response-surface method described by Martin [cf. 923].

1810 Csitkovics, A. & Magassy, L.
Cukorrépanemesítésünk helyzete és további lehetőségei. **(The position and further possibilities of sugar-beet breeding in Hungary).**
Növénytermelés 1958 : **7** : 95–106.

Sugar-beet breeding in Hungary is reviewed under the following headings: heterosis breeding; polyploid breeding; the use of male sterility in heterosis breeding; heterosis breeding with inbreds; interspecific hybridization; and further tasks in breeding. Tables giving results of varietal trials are included.

1811 Orlovskij, N. I.
(The most important achievements in breeding sugar beet in the last 40 years).
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 3 : 60–63. [Russian].

[Cf. XXVIII, 1939].

1812 Wauthy, R., Roussel, N. & Martens, M.
Les résultats des essais comparatifs de variétés de betterave sucrière en Belgique de 1953 à 1957. **(Results of the comparative sugar-beet variety trials in Belgium from 1953 to 1957).**
Publ. Inst. belge Amélior. Better. 1957 : **25** : 303–20.

A full account is presented of sugar-beet trials carried out by the Beet Institute at three centres in Belgium. Tabulated data are provided on the yield of roots, sugar and tops from 37 varieties; during 1957, the difference in sugar yield between the best and the worst varieties was about 27%.

1813 Olteanu, G. L., Mumjieva, E., Micu, A., Munteanu, E. & Blaj, D.
Contribuţii la crearea de soiuri şi producerea seminţei elită la sfecla de zahăr. **(Contributions towards the creation of sugar-beet varieties and the production of élite seed).**
Bul. şti. Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 401–25.

Extensive details are given of the root yield, sugar percentage and sugar yield of introduced and local strains under trial at various localities in Rumania since 1951. The best performance has come from the strains Roman 478, Roman 236, Bod 165 and Bod 177, all selections from the Polish introduction Buszczyński CLR.

1814 Fiedler, J.
Hodnota sazečkového semene československých odrůd cukrovek. **(The value of pedigree seed of Czechoslovak sugar-beet varieties).**
Sborn.-čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 265–76.

A series of varieties, including recent selections from Kralice and Bučany, were tested in varied environments in 1953–1955. It was found that external conditions did not alter the principal economic characteristics of any variety though most showed minor variability in different seasons and localities.

1815 Rusconi-Camerini, G.
Aspetti citologici e genetici relativi alla costituzione di barbabietole poliploidi. **(Cytological and genetical aspects concerning the production of polyploid beets).**
Ann. Sper. agr. 1958 : **12** : 1249–64.

Polyploid sugar-beet strains have been produced at the Beet Experimental Station, Rovigo, by immersing germinating seeds for 5 hr. in a colchicine solution. Data are provided on the number of tetraploids obtained and on their germinability in the C_1.

1816 Cherry, M.
A new British triumph in plant breeding.
Fmr. & Stk.-Breed. 1958 : p. 67 : and S. Afr. Sug. J. 1958 : **42** : 585–87.

An account is given of the development of the triploid sugar beet Triplex by British Pedigree Sugar Beet Seed Ltd., in cooperation with the Dutch firm, D. J. van der Have. In trials in England, the triploid has outyielded ordinary types by 12%. It has been estimated that, at current prices, the additional cost of seed production would be covered by a yield increase of only 2% over ordinary sugar beet.

1817 Németh, J.
A poliploid cukorrépa és magtermesztése. **(Polyploid sugar beet and its seed production).**
Magyar mezőgazdaság, Budapest 1958 : No. 6 : 7–8. [from Hungar. agric. Rev. 1958 : **7** : No. 3 : p. 3.] (Abst.).

In trials conducted over a period of four years in Hungary, polyploid varieties exceeded the diploids 242 and K91 by about 10% in yield of both roots and sugar.

1818 Vukov, K.
Néhany cukorrépafajta nagyüzemi összehasonlítása. **(Full-scale comparison of some sugar-beet varieties).**
Cukoripar. Budapest 1958 : No. 2 : 37–39. [from Hungar. agric. Rev. 1958 : **7** : No. 3 : p. 3.] (Abst.).

Full-scale trials held on farms in the Mezőhegyes area in Hungary showed that the triploid beet from Vép lacks the advantages of Beta Poly 1 and Beta Poly 3 but is similar in type to Beta K91. The high-sugar variety Udyez A was low in root yield and therefore was not superior in sugar yield.

1819 **(L. L. Sempolovskij—our oldest plant breeder).**
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 5 : 62–63. [Russian].

Mention is made of several sugar-beet varieties bred by Sempolovskij and his colleagues at the Uladovo-Ljulincy Breeding Station. The most recent of these is the nonbolter U752. Others are highly productive of roots, sugar and seed.

1820 Orlovskij, N. I.
(A maker of valuable sugar-beet varieties. On the occasion of the 90th birthday of L. L. Sempolovskij).
Selekcija i Semenovodstvo (Breeding & seed-growing) 1958 : No. 3 : 22–24. [Russian].

Mention is made of some varieties bred at Uladovo-Ljulincy by Sempolovskij and his colleagues. Most are characterized by high root, sugar and seed yields and resistance to disease; U752 is a nonbolter.

1821 Stein, H.
A correlation between anther pigmentation and pollen sterility in *Beta vulgaris*.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–831 : p. 752. (Abst.).

The high degree of sterility of pollen from red anthers in table beet was found to be the direct result of anthocyanin accumulation.

1822 Švarcman, E. N.
(The prospects for the introduction of monogerm sugar beet).
Sahar. Promyšl. (Sug. Industr.) 1957 : No. 3 : 54–55. [Russian].

Mention is made of breeding work on monogerm varieties at various Soviet breeding stations, especially at Belaja Cerkov' where new forms with improved earliness and yield and increased 1000-seed weight have recently been developed.

1823 Manželej, I.
(At the USSR Sugar Beet Institute)
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. 3 : 151–53. [Russian].

The breeding of the monogerm varieties Jaltuškov 552 and Belaja Cerkov' 111 and 144 for improved resistance to bolting and increased root and sugar yield is mentioned. A reference is made to trials of Soviet varieties and varieties introduced from Germany, Poland, Czechoslovakia, Hungary, Bulgaria, France, Denmark and Belgium in which the Soviet varieties surpassed all the others in sugar yield per unit area.

1824 Litošenko, B. S.
(Monogerm sugar beet).
Sahar. Promyšl. (Sugar Industr.) 1958 : No. 2 : 60–61. [Russian].

Belocerkovskaja Odnosemjannaja [Monogerm Belaja Cerkov'] was more productive of roots than an unspecified multigerm variety on the State Farm Kollektivist and its sugar content of 17·79% was only a fraction below that of the multigerm beet. In addition it was less severely attacked by black leg.

1825 Orlovskij, N. I.
(Reserves for increasing the sugar content of the beet).
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 2 : 56–58. [Russian].

Breeding varieties with high root and sugar yields and adapted to particular sets of climatic and soil conditions is briefly discussed. Mention is made of some unspecified new monogerm varieties and the following recent standard varieties with improved sugar contents: V031, R023, R931, V038, R06, U1722, V020, V541, P028 and F786.

1826 Aldrovandi, A.
La barbabietola da zucchero resistente alle malattie. **(Sugar beets resistant to disease).**
Sementi elette 1958 : **4** : No. **3** : 26–31.

The success attained in breeding beets resistant to the curly-top virus is contrasted with the difficulties encountered in the search for resistance to *Cercospora beticola*; the resistant hybrids derived by Munerati from *Beta maritima* are inferior in yielding ability and recourse must still be had to the use of fungicide treatment in areas of severe attack.

1827 Sinjagin, I. I.
(Beet sowing in the Hungarian People's Republic).
Sahar. Svekla (Sug. Beet) 1958 : No. 2 : 43–45. [Russian].

Cercospora-resistant sugar-beet varieties bred in recent years at Sopronhorpács are discussed. Beta 243–53 was the most common variety in 1957 but it is being gradually superseded by Beta K–91 which yields 4–5% more sugar per unit area. Beta K–91 in its turn is outyielded by the new triploid varieties Polybeta 1 and Polybeta 3 which have a 10% higher sugar yield.

STIMULANTS

1828 Vogelsang, A.
Presse und Agrarier besuchen niederösterreichische Tabakplantagen. **(Press and agriculturalists visit Lower Austrian tobacco plantations).**
Tabakpfl. Öst. 1957 : **8** : No. 3 : 1–5.

In this popular account, a brief mention is made of the high yielding variety Europa-Union, of varietal trials carried out at Hadres and of the breeding of new varieties.

1829 Gutierrez, M. E.
A promising trade for local smoke manufacturers.
Pl. Industr. Dig., Manila 1958 : **21** : Nos. 2–4 : 8, 22.

The Bureau of Plant Industry in the Philippines has introduced varieties of White Burley tobacco and produced three new strains adapted to local conditions; four Turkish hybrids were also developed, Harom being the most outstanding.

1830 Krishnamurty, K. V. & Apparao, K.
Abnormal pollen tube development in a *Nicotiana* hybrid.
Curr. Sci. 1958 : **27** : 397–98.

F_1 *N. longiflora* x *N. alata* was almost sterile, with about 20% stainable pollen which usually failed to germinate on the stigma of the same flower, other hybrid plants or the parents. Irregularities in meiosis were responsible for the low pollen fertility. On an agar-sucrose medium, pollen grains of the hybrid showed a vigorous development of tubes, with a germination percentage of over 90%. Only 50% of the grains, however, produced normal tubes, the remainder giving rise to tubes with branching and other abnormalities. Pollen of the parents was completely normal in tube development on the agar-sucrose medium. The few hybrid grains germinating on hybrid or parental stigmas, with or without the aid of agar sucrose, included some with abnormal tube development even in the absence of the medium. Abnormal development may therefore be a characteristic of the pollen of this hybrid.

1831 HAGEN, G. L. & GUNCKEL, J. E.
Free amino acid levels in *Nicotiana glauca, N. langsdorffii* and their interspecific hybrid following gamma irradiation.
Plant Physiol. 1958 : **33** : 439–43.

Leaf abnormalities induced by exposure to various dosages of γ radiation for a period of two months were associated with increased content of free aminoacids in the affected leaves, *N. glauca* being the most and *N. langsdorffii* the least radiosensitive, with the hybrid giving an intermediate response.

1832 KISFALUDY, M.
A dohánynemesítés helyzete Magyarországon. (**The state of tobacco breeding in Hungary**).
Dohányipar, Budapest 1957 : 6–11. [from Hungar. agric. Rev. 1958 : **7** : No. **3** : p. 4.] (Abst.).

A selection from the introduced cigar tobacco Havana II is being released for commercial production. The garden tobacco KP Garden, developed through selection of the progeny of the cross Kerti [Garden] x Diebel, grows rapidly, produces 30–35 leaves and has good colouring, low volume weight and good filling capacity. KÉ Virginia was selected from Garden x Virginia; it has a growing period of 100–110 days, produces 16–17 useful leaves and its drying may be completed earlier in August. Although ripening earlier than the Virginia parent, KÉ Virginia equals the latter in yield. In breeding for heterosis in yield of leaves, the following combinations have shown the most marked hybrid vigour: Garden x Debrecen, Garden x Virginia, Tisza x Garden, Tisza x Virginia and Havana x Szuloki. In Tisza x Virginia and Garden x Virginia, the good colouring and suitability for artificial drying of the Virginia parent decreased.

1833 KELLER, K. R.
Registration of tobacco varieties.
Agron. J. 1958 : **50** : 712–13.

The first descriptive list is given of varieties approved for registration by the US Department of Agriculture in cooperation with the American Society of Agronomy. The varieties comprise Dixie Bright 101, Havana 142, Havana 307, Havana 425, Virginia Gold, Virginia 21, Virginia B–29, Virginia 45, Virginia 321 and Yellow Special–A.

1834 ČIRKOVSKIJ, V. I.
[The question of evolutionary and ecological study of tobacco (*Nicotiana tabacum* L.)].
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 202–11. [Russian].

Observations on dormancy of the seed of varieties grown in humid or arid districts are discussed in relation to the evolutionary history of *N. tabacum*. It is thought that it arose as a perennial plant in a tropical climate whence it was introduced by man to the subtropics.

Two distinct ecotypes then evolved, one adapted to humid climates such as the Black Sea Littoral and the other adapted to dry climate, as for instance in Kirgizia or the Kuban' steppe. Varieties of the latter ecotype, Ostrokonec 45 [Pointed-end 45] and Tyk-Kulak 92, possess greater plasticity to altered environments and are more suitable for cultivation in the new tobacco districts in Russia and Siberia.

1835 MOAV, R.
Inheritance in *Nicotiana tabacum* XXIX: The relationships of residual chromosome homology to interspecific gene transfer.
Amer. Nat. 1958 : **92** : 267–78.

Introgressive transfer of a genetic locus of one species into the genome of a second species involves an interspecific chromosomal exchange. This exchange may result from a random break and reunion or the exchange may be nonrandom, involving certain chromosomes of the recipient species more frequently than others. In order to see which of these alternatives is more likely, the locus *Ws*, responsible for nonwhite seedlings, of *N. plumbaginifolia* was transferred repeatedly into the genome of *N. tabacum*. The method used involved crossing autotetraploid *N. tabacum* with diploid *N. plumbaginifolia* to give the sesquidiploid hybrid; this latter was then back crossed to *N. tabacum*. Repeated back crossing yielded diploid *N. tabacum* plants with a single marked chromosome of *N. plumbaginifolia*.

By selfing four heterozygous segmental substitution plants of independent origin, a number of homozygous segmental substitution lines were obtained; these lines showed some quantitative variability. It was found that out of 14 chromosome transfers, eight involved the same chromosome of *N. tabacum*; the other six transfers were equally distributed over three other chromosomes. This nonrandom distribution supports the view that some residual homology exists between the chromosomes of the two species. An alternative method of transferring a locus from one species to another involves treating heterozygous addition plants, carrying one extra alien chromosome, with certain mutagenic agents. However a mutagen-induced translocation is a random event and makes no use of residual homology between chromosomes of the two species. It is pointed out that when residual homology is utilized, the chances are better that in at least some of the segmental substitution lines, the introgressed segment will provide a successful substitute for the replaced genes.

1836 Izquierdo Tamayo, A.
Estudios sobre tetraploides en el género "Nicotiana." III. Influencias estacionales en la duración del período vegetativo y desarrollo de tetraploides y diploides de *Nicotiana rustica* y *Nicotiana tabacum*. (**Studies of tetraploids in the genus *Nicotiana*. III. Seasonal influences on the length of the vegetative period and development of tetraploids and diploids of *N. rustica* and *N. tabacum***).
Bol. Inst. Invest. agron., Madr. 1958 : **18** : No. 38 : 49–83.

In experiments conducted at Seville, Spain, during 1949–52, diploids and the corresponding tetraploids of *N. rustica* 'Erbasanta' had a vegetative period, from transplanting to flowering, of 50–70 and 100–140 days respectively, under optimum conditions. For *N. tabacum* 'Hybrid 196–A' the corresponding figures were 50–70 and 110–160 days. For 4*n N. rustica* the tallest plants were found among those grown from January or February to May; autumn-grown plants also did well. Diploid *N. rustica* followed the same seasonal trend but also grew well in the summer. The optimum season for 4*n N. tabacum* lasted from May to autumn while in the diploid it occurred in May and early summer, indicating that the tetraploid either tolerates or requires higher temperatures than the diploid. In both species the diploids were generally taller at the time of flowering than the tetraploids.

1837 Peyrot, J.
Les travaux du 2e Congrès Scientifique du Tabac, Bruxelles 1958. (**The proceedings of the 2nd Scientific Tobacco Congress, Brussels 1958**).
Rev. int. Tabacs 1958 : **33** : 110–13.

In a paper read by Schmid, mention was made of some genetical studies of tobacco in progress in various countries. Several genes are thought to control the total alkaloid content of tobacco; the genes are probably unspecific in action and have a cumulative effect. Plants are usually heterozygous for these genes and the selection of lines with low nicotine content is difficult. Factors controlling nicotine content are not linked to those responsible for the transformation of nicotine into nornicotine; it is therefore feasible to obtain varieties poor in both nicotine and nornicotine.

1838 Garber, E. D. & Heggestad, H. E.
Observations on the pathogenicity of biochemical mutants of *Pseudomonas tabaci*.
Phytopathology 1958 : **48** : 535–37.

Twenty varieties of *Nicotiana tabacum* and ten other species of *Nicotiana* were inoculated with five mutants of *Ps. tabaci* differing in aminoacid requirement. The mutants were not pathogenic to most species and varieties. *N. longiflora*, *N. repanda*, *N. rustica* var. *brasilia* and *N. tabacum* 'Burley 21', 'Bel 6–62' and 'Bel 248C–2D' were resistant to all the mutants and to the parental isolate. Only the mutant requiring leucine was pathogenic to any variety of *N. tabacum*. *N. glutinosa* was susceptible to four of the mutants, being susceptible to a greater number than any other host. The nutrition-inhibition hypothesis offers a possible explanation of the observed pattern of reaction.

1839 Maine, E. C. & Kelman, A.
Possible mechanisms of resistance in solanaceous plants to *Pseudomonas solanacearum*.
J. Elisha Mitchell sci. Soc. 1958 : **74** : 85–86. (Abst.).

Evidence has been obtained suggesting that chlorogenic acid is involved in the resistant reaction of tobacco to the above pathogen.

1840 Heggestad, H. E. & Neas, M. O.
The disease resistant varieties Burley 11A and 11B and observations on tobacco black shank in Tennesee.
Bull. Tenn. agric. Exp. Sta. 1957 : No. 261 : Pp. 25.

Information is provided on the performance of Burley 11A and 11B, which are resistant to black shank, black root rot and *Fusarium* wilt [XXIV, 3215]. Both varieties were developed from a cross between the Burley tobacco Kentucky 16 and the black-shank resistant flue-cured type Vesta 64 [Yellow Special x strain 54 (White Stem Orinoco x Florida 301 back-crossed twice to White Stem Orinoco)] which derives its black-shank resistance from the cigar-wrapper type Florida 301 (Big Cuba x Little Cuba). Burley 11B has proved to be somewhat more disease resistant than Burley 11A. The latter, however, is better in quality and, in the absence of disease, slightly higher in yield.

1841 TERNOVSKIJ, M. F.
(Utilizing wild tobacco species in breeding for resistance to diseases).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. 1 : 137–39. [Russian].

Interspecific hybridization and back crossing to *Nicotiana tabacum* were the methods employed at Krasnodar to obtain good tobacco varieties with combined resistance to tobacco mosaic virus and *Erysiphe*. The following new varieties derive their resistance from either *N. glutinosa* or *N. sylvestris* x *N. tomentosiformis*: Dubec 566, Dubec 7, Samsun 47/10, Alma-Ata 315, American 287, Trebizond 161, Trebizond Talass and Immunnyj 3000 [Immune 3000]. Breeding *N. rustica* varieties resistant to tip chlorosis has begun, with *N. glauca* providing the resistant parent. Some fertile hybrids of *N. rustica* and *N. tabacum* are now available as breeding material.

1842 HARADA, S., TOYAO, T. & INABA, T.
(Studies on the utilization of polyploidy in the tea plant. I.).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 10 : 9–14. [Japanese].

[Cf. XXVIII, 4542].

1843 NAKAYAMA, A. & HARADA, S.
(Studies on the rooting capacity of cuttings of tea-plant varieties. III. Cutting size, starch content and rooting capacity).
Chagyo Kenkyu Hokoku/Tea Res. J. 1958 : No. 11 : 18–20. [Japanese].

[Cf. 571].

1844 VISSER, T. & DE WAAS TILLEKERATNE, L. M.
Observations on the germination and storage of tea pollen and seed.
Tea Quart. 1958 : **29** : 30–35.

Investigations on the above were undertaken with a view to future breeding at the Tea Research Institute, Ceylon. Pollen germinated well in water or 5–25% sugar solutions. Stored at 32° F., it maintained viability best at a relative humidity of 40%, nearly 70% germination being obtained after storage for 3 months. If accelerated germination is desired, fresh seeds should be presoaked and have their coats cracked or removed. Seed stored at 32° F. maintained its viability best at higher humidities, presumably because the seeds were better able to germinate before infection by rotting pathogens than at lower humidities.

1845 VISSER, T.
The validity of assessing tea yields on a basis of intermittent plucking and test plucking.
Tea Quart. 1958 : **29** : 21–29.

In an attempt to lessen the labour and time entailed in assessing yields, investigations were conducted at the Tea Research Institute, Ceylon, to determine (1) to what extent yields based on intermittent plucking were representative of absolute yields from field experiments and from individual clones, and (2) whether test plucking could serve as a reliable basis to estimate the potential yield of a clone early in its cycle. In intermittent plucking, yield scoring was restricted to every second, third, fifth or seventh pluck. Test plucking was based on the yield of a consecutive number of plucks. Each clone was represented by about 12 bushes. Yields of field experiments calculated from third plucks (in the last completed pruning cycle) and yields of clones estimated from second plucks (for at least one year in the first pruning cycle) may be expected to be as satisfactory criteria of comparison as yields based on all plucks. Fresh-weight and dry-weight yields were highly correlated. With respect to test plucking of clones, the data indicated that yield from the second series of 10 plucks in the first year after the bushes came into bearing would suffice for the choice of the best clone out of every 10 under trial. Selection of the next best clones would be possible if further test plucks were carried out during the second year.

1846 BAHTADZE, K. E.
(The progress of tea cultivation in the USSR).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. 4 : 22–32. [Russian].

Varieties bred at Čakva differing in leaf size and degree of winter hardiness are briefly referred to [cf. XXVIII, 801].

1847 Tomo, N., Fuchinoue, Y. & Fuchinoue, H.
(On the technique of selecting the tea plant for resistance to cold. I. On the resistance to cold of the young plant).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 10 : 20–23. [Japanese].

The correlations previously noted in fully mature bushes between cold resistance, on the one hand, and osmotic pressure, plasmolytic permeability and content of hydrophilic colloids, on the other, break down in bushes only a few years old in which susceptibility to cold is high. This may explain why selection for cold based on the correlations quoted has sometimes been ineffective.

1848 Müntzing, A.
Disease resistance in field trials with cacao at Hacienda Clementina, Ecuador.
Trop. Agriculture, Trin. 1958 : **35** : 276–78.

As judged by total infection (fan and cushion brooms), ICS clones were on the average less resistant to witches' broom than locally selected clones. ICS 89, 32, 100 and 80 were however noteworthy for their high degree of resistance. Most resistance was shown by SCA6, SCA12 and P12A. Clonal differences were observed in general pod infection, due chiefly to witches' broom but also to other pathogens such as *Monilia* and *Phytophthora*. General pod resistance was on the average better in local selections than in ICS clones. SCA6 and SCA12 were fairly good as regards pod resistance but P12A was poor. Pod resistance to disease was largely independent of resistance to floral and vegetative infection by witches' broom. It appeared that specific pod resistance rather than disease avoidance occurred in the Ecuadorian and Upper Amazonian clones and in some ICS clones.

1849 Knaben, G.
Papaver-studier, med et forsvar for *P. radicatum* Rottb. som en islandsk-skandinavisk art. **(*Papaver* studies, with a vindication of *P. radicatum* Rottb. as an Icelandic-Scandinavian species).**
Blyttia 1958 : 61–80.

After giving reasons for regarding *P. radicatum* as a valid name, an account of the morphology and distribution of the three arctic species *P. radicatum* ($2n = 70$), *P. dahlianum* ($2n = 70$) and *P. lapponicum* ($2n = 56$) is given. Each comprises several phenotypically distinct races differing in chromosome structure.

1850 Meneret, G. & Saint-Michel, A. de
Les houblons de la récolte 1957. **(Hops from the 1957 harvest).**
Brasserie 1958 : No. 141 : Pp. 12.

Information is provided on the performance of a series of varieties studied at several centres in France.

1851 **Institute of Brewing Hop Trials: 1956 Crop.**
J. Inst. Brew. 1958 : **64** : 388–91.

The results are reported of trials carried out on D1, D3, J2 and OF27, the varieties being studied with respect to physical appearance of the hops, resin content and suitability as copper hops. As in previous years [cf. XXVIII, 828] the wilt tolerant hops D1 and D3 were considered to be acceptable as replacements for Fuggles to the extent of at least 25% of the hop grist. J2 was less satisfactory than in previous years and some brewers found it unsuitable as a replacement for Fuggles; OF27 was not acceptable to all the brewers who tested it even at a 25% level of replacement.

MINOR CROP PLANTS

1852 Soltanovskaja, G. A.
(The sweet pepper variety Konservnyj Belyj 289).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : p. 26. [Russian].

Konservnyj Belyj 289 [Canning White 289] was selected from Konservnyj Rannij 288 [Canning Early 288] at Simferopol'. It yields up to 240 c. per ha. and its keeping properties and transportability are good. The average weight of a fruit exceeds 40 g. and it has sweet tender flesh 3–4·5 cm. thick. The contents of dry matter and vitamin C are 9·8% and 221·2 mg. % respectively.

1853 Campos, F. F. & Morgan, D. T. (Jun.)
Haploid pepper from a sperm.
J. Hered. 1958 : **49** : 135–37.

A homozygous diploid line, derived from a haploid of Perfection Pimento by colchicine treatment, was crossed as ♀ with Floral Gem. A single atypical plant in the F_1 showed the foliar and fruit characters of the ♂ parent only. Its fruits were sterile. Root-tip and PMC examination showed the plant to be haploid ($n = 12$).

1854 Jakob, K. M.
Secondary association in the castor oil plant.
Cytologia, Tokyo 1957 : **22** : 380–92.

At pachytene, about 35% of the analysable cells exhibited H and cross-shaped configurations of four chromosomes. Associations involving chromosomes E and G were observed in 19% of the cells. The centromeres of E and G usually occupied a central position in the configuration. Examination of the macrochromomere pattern of free pairs of E and G suggested that homology between these chromosomes was restricted to two very small regions respectively situated in the long arm of E and short arm of G, adjacent to the centromeres. At diacinesis and metaphase I, configurations of four chromosomes with or without chiasmata were seen. At diacinesis it was possible to observe that associations involving E and one other chromosome, presumably G, were as a rule without chiasmata. The frequency of associations of E and G at pachytene corresponded with the frequency of associations of E and one other chromosome at diacinesis. In *Ricinus*, secondary association may be the consequence of either or both of the following events during zygotene-pachytene: (1) fusion of the chromosomes at the centromeres and (2) exchange of portions of pairing strands.

1855 Winterkoolzaad, 1958. **(Winter swede rape, 1958).**
Landbouwvoorlichting **15** : Bijl. 31; Ber. Rassenkeuze 1958 : No. 248 : unpaginated.

In yield trials of six varieties in the Netherlands, the new varieties MPI6/52 and Mansholt's 2956 have shown promise.

1856 Rudorf, W.
Experimentell aus ihren Ursprungsarten hergestellte Rapsformen im Vergleich mit natürlichen Raps. **(Comparison of rape forms experimentally produced from their component species with natural rape).**
Fette, Seifen, Anstrichmtl. 1957 : **59** : p. 930.

Synthetic swede rape ($2n = 38$) equal to or even better than natural swede rapes in yields of seed and oil have been produced at Köln-Vogelsang, Germany, by crossing cabbage ($2n = 18$) with turnip rape ($2n = 20$). Induction of polyploidy was carried out either in the parents prior to crossing or after crossing in the F_1 hybrids. The possibility of increasing yields by selection is regarded as promising.

1857 Rautou, S. & Cognot, J.
Essais de variétés-hybrides de ricin dans la région méridionale. **(Trials of hybrid varieties of castor-oil plant in the southern region).**
CR Acad. Agric. Fr. 1958 : **44** : 643–47.

The results are reported of trials held at Montpellier with varieties and F_1 hybrids, mainly from the USA. High productivity seemed to be associated with the production of unisexual female racemes. The hybrid H–6, the most productive of the semiearly varieties tested, was completely female.

1858 Kobayashi, T.
Radiation genetics of sesame—Part I. Meiotic chromosome aberrations induced by absorbed radioactive phosphorus.
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 1–12.

An analysis was made of aberrations induced in the PMCs of plants treated with P^{32} by stem injection, root immersion and leaf immersion. The first method was the most effective. At metaphase I, rings, chains and other aberrant configurations were frequently observed and probably resulted from segmental interchanges between nonhomologous chromosomes. Abnormalities at anaphase I included laggards, acentric fragments, bridges, stickiness and multipolar spindles. The relationship between aberration frequency and dosage was linear. Chromosome A often remained unaffected by breakage. On the basis of the assumption that breakage occurs more often in heterochromatic regions than euchromatic, chromosome A may consist of many euchromatic segments.

1859 Arzumanova, A. M.
(Utilizing a sesame collection as initial material for breeding indehiscent forms).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 40–44. [Russian].

An account of breeding work at Taškent, with a brief reference to similar research at Krasnodar, using a collection of forms from Soviet territories, the Middle East, Japan and other countries, is given. The results include the indehiscent varieties Serebristyj 2 [Silver 2], Serebristyj 3 and Hybrid 94, all three from fertilization of K742 by the pollen mixture K561 + K743 + K440, the last mentioned pollen parent being an indehiscent form from Japan, and Hybrid 365 (Taškent 122 x K561 + self pollen). All the above new varieties have white or off-white seed and are superior to the standard variety Taškent 122 in productiveness, oil content and resistance to *Fusarium*. Mention is made of recent accessions from China to the *Sesamum* collection of the Institute of Plant Industry; these are mostly hybrids or selections of an indehiscent Japanese form.

1860 **New Arny variety of flax released.**
Crops & Soils 1958 : **11** : No. 1 : p. 21.

Arny is a brown-seeded, blue-flowered variety released jointly by the US Department of Agriculture and the University of Minnesota. It comes from a cross between Crystal and Redson. In yield and maturity, Arny is similar to Redwood. Arny is immune to prevalent races of rust, the hereditary factor responsible for the immunity being different from that used in other late varieties. Arny is also said to be more resistant to wilt than any other commercial variety; it equals Marine as regards tolerance of pasmo. This new linseed is taller than other varieties but it is more resistant to lodging. The quality of the oil from Arny is slightly superior to that of oil from Redwood. The total oil content of Arny resembles that of other recommended varieties.

1861 Doucet, M., Bilcescu, O., Doucet, V. & Hriţcu, P.
Cercetări asupra utilizării mixte a inului pentru ulei. (**Experiments on dual-purpose utilization of linseeds**).
Bul. şti. : Sect. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 373–87.

Rumanian and introduced linseed varieties have been investigated to ascertain their suitability as fibre producers. The best dual-purpose variety was Deta, a selection of a local Banat variety, followed by Domneşti 22.

1862 Merfert, W.
Eine neue Selektionsmethode in der Sonnenblumenzüchtung. (**A new method of selection in sunflower breeding**).
Züchter 1958 : **28** : 229–32.

The central florets of the sunflower normally produce poorly developed fruits, many of which are without embryos. Investigations at the Plant Breeding Institute, Bernburg Saale, revealed that these florets will produce well developed fruits, somewhat larger than those from the peripheral florets, if these latter are removed after flowering.

This treatment makes it possible to use the central florets for hybridization experiments; crosses may be made at a later stage in development than would be possible if the outer florets were used. This is an advantage, for many important characters, including characters of the inflorescence and fruits, cannot be judged before the outer florets have bloomed. With this additional information, the selection of suitable plants for hybridization is facilitated. The removal of the outer fruits does not seem to render the plant more susceptible to disease and the reduced number of fruits obtained from each inflorescence has not been a great disadvantage.

Details are provided of the technique used in effecting controlled pollinations using the central florets.

1863 Šimanskij, N. K.
(**Pollination of the sunflower by pollen of other species**).
Agrobiologija (Agrobiology) 1958 : No. 2 : 131–33. [Russian].

Bagged seed heads of the sunflower VNIIMK 8932 [Oil Plants Institute 8932] were supplementarily pollinated by the pollen of *Cirsium*, maize, Sudan grass, dandelion, egg plant or castor oil plant at Odessa.

This resulted in noticeable improvements of seed sets and a reduction of the depressive effects of selfing observed in the F_1.

1864 Habura, E.-Ch.
Heterosis in Ertragsmerkmalen bei der Sonnenblume. (**Heterosis in yield characters in the sunflower**).
Züchter 1958 : **28** : 285–87.

In the course of studying incompatibility relationships between and within different sunflower lines, a number of selfings and crosses were effected at the Institute for Plant Breeding, Bernburg, Germany; of about 100 crosses, 25 showed visible heterosis with respect to growing capacity. The heterosis was mainly expressed in an enlarging of the vegetative organs, this being most marked in crosses between types of differing growth habit. All the types with improved growth gave good yields of seed.

In making the crosses, no consideration was taken of the characters determining oil yield such as oil content and the proportion of seed in the fruit. With respect to the proportion of husks per given weight of seeds, no difference was found between hybrid and selfed seed, indicating that there is no inbreeding depression in this respect. The proportion of seed per fruit was found to be a stable character with an heritability of 73·0% in the 15 combinations studied.

The oil content of hybrid seed was about 1·3% higher than that of selfed seed of the same line

($P = 8{\cdot}5\%$). Oil content was found to be more influenced by environmental conditions than the proportion of seed per fruit, the heritability of the former being 21·0%. It was also found that oil content is negatively influenced by inbreeding but it shows marked heterosis on hybridization.

These results are discussed in relation to breeding improved sunflowers. The breeding of synthetics, using varieties with satisfactory morphological characters, is recommended; the procedure for producing synthetics is outlined.

1865 HEISER, C. B. (JUN.)
Three new annual sunflowers (*Helianthus*) from the southwestern United States.
Rhodora 1958 : **60** : 272–83.

Descriptions and Latin diagnoses of the following are given: *Helianthus paradoxus*, from Texas and New Mexico; *H. neglectus*, from Texas; and *H. petiolaris* ssp. *fallax*, from Colorado, Utah, New Mexico and Arizona. Crosses of *H. neglectus* with other diploid species ($n = 17$) were studied. Hybrids with the cytological races A and B of *H. petiolaris* gave F_1 progenies varying in pollen sterility, both races appearing to differ from *H. neglectus* by at least one translocation; the hybrids involving race B were generally higher in pollen fertility.

Greater pollen sterility and structural differences in the chromosomes of the parents were found in the single hybrid obtained from *H. neglectus* x *H. petiolaris* var. *canescens*. In *H. neglectus* ♀ x *H. annuus* ♂, pollen fertility and seed set were very low and meiotic configurations showed one or more chains; the reciprocal cross failed. *H. debilis* comprises two cytogenetic races, one of which includes ssp. *praecox* and the other ssp. *cucumerifolius*. Crosses of *H. neglectus* with the former gave F_1 hybrids with higher fertilities than those with the latter; similar results were obtained in crosses of *H. petiolaris* with these subspecies. Varying fertility has been found in crosses between *H. petiolaris* ssp. *fallax* and different races of *H. petiolaris* ssp. *petiolaris*.

1866 ALEKSEEV, A. P.
(Short-day treatment as a means of selection of early forms in the sunflower).
Agrobiologija (Agrobiology) 1958 : No. 2 : 76–80. [Russian].

Breeding sunflowers for short growth periods and short stems, suitable for combine harvesting, at Rostov is reported. The methods consisted of (1) growing varieties under short days and selecting short-stemmed and early forms which appear to breed true for these characters, and (2) training for these characters by growing varieties under short days for several generations.

Tabulated information showing the changes obtained in the F_2 of VNIIMK 6540 [Oil Plants Institute 6540] by the first mentioned method and in the F_1–F_4 of L 489 by the other method is presented. The experiments indicate that some varieties show little or no response to short-day treatments.

1867 JOGLEKAR, R. G. & DESHMUKH, N. Y.
Inheritance of floret colour in safflower (*Carthamus tinctorius* Linn.).
Proc. Bihar Acad. agric. Sci. 1956 : **5** : 90–116.

Data obtained from six crosses at the Agricultural Research Institute, Nagpur, indicated that floret colour was controlled by three independent genes, *Y*, *D* and *I*. Yellow florets turning to pink upon fading depended on the basic gene *Y*. *D* intensified the action of *Y*, deep yellow florets being produced which turned red upon fading. By itself *D* was inert. In the presence of *I*, yellow or deep yellow florets retained their colour when faded. The percentage of natural cross pollination was also determined; it ranged from 2·86 to 16·66%.

1868 LOVE, A. & LOVE, D.
Biosystématique du genre Acorus. (**Biosystematics of the genus *Acorus***).
Ann. ACFAS 1957 : **23** : p. 100. (Abst.).

In Europe, this genus is represented by *A. calamus*, which came from India. Its roots contain more medicinal substance than *A. gramineus* and *A. cochinchinensis*; these two species also grow in India and are fertile diploids. *A. calamus* is sterile and considered to be an autotriploid of *A. cochinchinensis*; it has the chromosome number of $3n = 36$. *A. triqueter*, occurring in the north-east region of Asia and Siberia, is tetraploid. *A. americana* is considered to be indigenous in America; it is fertile and diploid.

1869 WULFF, H. D. & FRITZ, E.
Untersuchungen an einem variegaten Kalmus (*Acorus Calamus* L.). [**Investigations on a variegated sweet-flag (*A. calamus*)**].
Flora, Jena 1958 : **146** : 328–39.

A variegated tetraploid form of *A. calamus* is described; it resembles the green type from Leningrad in having an S-shaped leaf tip but it has a lower content of essential oil in the rhizomes and the calcium oxalate content of the leaves is higher. This form has not bloomed during 20 years of observation at the Botanical Garden of Kiel University.

Quantitative estimations of the essential oil content of the rhizomes were also made for several other types of *Acorus*; it was found that the value for the Montreal type is 5·17% instead of 2·1% as previously published. From a comparison of essential oil and calcium oxalate contents, it was concluded that the type Leningrad, found in North Asia and Siberia, may possibly be closely related to the diploid North American form Montreal.

1870 SENJO, O. & SAKAI, M.
(**Studies on the ecology and morphology of *Coptis japonica* in the prefecture of Fukui**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 143–44. [Japanese].

The above plant is a source of berberin. Two local types are described which differ in habit and degree of resistance to frost.

1871 CHLÁDEK, M. & ROD, J.
Význam polyploidie ve šlechtění heřmánku pravého (*Matricaria chamomilla* L.). [**The importance of polyploidy in breeding chamomile (*M. chamomilla* L.)**].
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 305–16.

Colchicine-induced tetraploids had larger heads and higher 1000-seed weight than the initial local strain from Brno. The polyploids showed greater variability in azulene and essential-oil contents than the diploid strain and a form with double the amount of azulene was selected.

1872 CHLÁDEK, M., KOŠOVÁ, V. & HRUBÝ, K.
Blütenfasziationen bei echter Kamille (*Matricaria chamomilla* L.) und die Möglichkeiten der wirtschaftlichen Verwertung solcher Formen. [**Flower fasciations in chamomile (*M. chamomilla* L.) and the possibilities of the economical use of such forms**].
Pharmazie 1958 : **13** : 712–18.

A wild-growing form with fasciated stems and capitula was found near Pohořelice in Czechoslovakia. Its yield and content of azulenogenic substances were lower than for standard varieties, but colchicine-induced tetraploids ($2n = 36$) of the aberrant form had large flowers with higher contents of essential oils and azulenogenic substances than small or large-flowered standard varieties.

1873 GAROT, A.
Seleksi Hevea—tjara baru jang dipertjepat pada P.P.N. (**Hevea selection—a new rapid method at the State Planting Centre**).
Menara Perkebunan 1958 : **27** : 139–50.

The present selection method employed by the Central Association of Experimental Stations in Indonesia requires a period lasting about 20 years from the selection of the mother tree to the time of recommendation for large-scale planting. A more rapid procedure taking only 8–10 years is described. Three stages are involved: (1) mother-tree selection, in which selection is made for stem, branching and leaf characters, vigour, mildew resistance and suitability for budding; (2) budwood tests, in which the new clones are budded on to about 200 stocks per clone, grown in alternate strips with control clones and subjected to detailed observations of growth, shade tolerance and the characters noted above; and (3) field-scale production tests, which may take place after about 1½ years of budwood testing and cover 2 ha. per clone.

1874 GAROT, A.
Mempertjepat seleksi *Hevea*. (**Speeding up *Hevea* selection**).
Menara Perkebunan 1958 : **27** : 195–201.

At the State Plantation Centre, Indonesia, acceleration of flowering in clonal grafts was effected by first topping the buddings at 8 months to increase branching and then ringing the branches at 14 months with thick wire; six months later, during the dry season, flowering occurred on more than half of the ringed branches. A promising clone in which 70% of the trees flowered at the age of two years, without ringing, is also mentioned.

FRUITS AND NUTS

Fifth Annual Report of the Scottish Horticultural Research Institute, 1957-1958 (1958) : Pp. 51.

1875 *Wood, C. A. Pomology. (pp. 9–16).*
Raspberry. A further 31 seedlings have been selected from crosses having either Malling Jewel or Malling Exploit as one parent and preliminary assessments have been made of progeny from four intervarietal crosses involving the East Malling seedling 64/53. More than 3000 seedlings, from 34 families, were planted as part of the long-term breeding programme. Pollinations included two further intervarietal crosses, 39 interspecific crosses and nine self

pollinations of *Rubus* species. Most of the interspecific crosses produced seed but it is not known to what extent seed production resulted from apomixis.

Black currant. Seed produced in 1956 from intervarietal and interspecific crosses gave nearly 4000 seedlings and further crosses were made in 1957.

1876 *North, C. Vegetable culture.* (*pp. 17–22*). Varietal trials were carried out with cabbage, Brussels sprouts, spinach, broccoli, celeriac, celery, French bean, broad bean, canning pea, sugar pea, parsnip-rooted parsley, carrot and beetroot, special emphasis in many cases being placed on suitability for processing.

Brussels sprouts. Plants from a wide range of F_1, F_2 and triple-cross families were selfed and pair-crossed by hand pollination and about 8% of the plants from one of the F_2 lines were partially or completely male sterile. The most promising lines derived from crosses described previously [XXVIII, 4583] were from Cambridge Special x Ashwell and were dwarf plants giving firm, smooth, dark green, relatively rot-free sprouts. Lines from Amager x Cambridge Special were less productive but showed a high degree of uniformity.

Cabbage. One of the F_2 lines from Christmas Drumhead x Blåtopp [Bluetop] was extremely uniform and gave a high proportion of good quality, autumn-maturing heads. Selected plants were selfed and pair-crossed and also vegetatively propagated. Selection was also made among families from crosses between January King and Amager types and from January King x Ormskirk Savoy back crossed to January King.

Phaseolus. Disappointing results were given in field trials of stocks from crosses between *Phaseolus multiflorus* (*coccineus*) 'Princeps' and *Ph. vulgaris* 'Record'. Further crosses were made using other varieties and using a dwarf bean from Czechoslovakia said to have arisen from a cross between *Ph. coccineus* and *Ph. vulgaris*.

1877 *Swarbrick, T. Genetics.* (*pp. 23–29*).

Currant. Crosses have been made in all possible combinations between the black-currant varieties Amos Black, Brödtorp and Baldwin and the red-currant varieties Minnesota, Red Lake and Laxton's 1. Only seedlings from Minnesota x Brödtorp have so far been obtained; they are intermediate between their parents in size and shape of hairs and external glands.

Strawberry. In the study of chlorotic disorders two principal types of abnormal behaviour have been observed. In the first case plants produced variegated leaves throughout the year, the chlorotic sectors being yellow at first and then becoming white. In the second case variegated leaves are produced in the spring and normal leaves in the summer. The variegation in this group is of two kinds; either green and yellow mottling with occasional white streaks or leaves which are initially pale yellow but which develop green pigmentation from the midrib outwards. These abnormalities are heritable, though their mode of inheritance is still obscure. Although June Yellows is normally not transmitted through the pollen over 40% of the seedlings from Tardive de Léopold [Late Leopold] x Auchincruive Climax were chlorotic whereas no abnormal seedlings were obtained when other pollen parents were used. In an attempt to reduce the number of chromosomes involved and thus to simplify the problem, hexaploid ($2n = 42$) seedlings, some showing June Yellows, were obtained from a cross between Climax and *Fragaria vesca* ($2n = 28$) but it has not yet proved possible to cross these seedlings with diploid species ($2n = 14$).

1878 *Reid, R. D. West of Scotland Unit (Auchincruive).* (*pp. 41–43*).

Strawberry. Breeding, selection and testing for resistance to red core continued although frost damage prevented reliable assessment of cropping characteristics. All of the 36 isolates of *Phytophthora fragariae* fell into four groups in respect of their ability to infect the four indicator varieties of strawberry used. A total of 573 plants immune to the Huxley race of *Ph. fragariae* has been found, some derived from selfs or crosses of resistant varieties and others from *Fragaria elatior*, *F. virginiana* and *F. ovalis*. Many are immune to a second race but all are susceptible to a race which infects Climax. A high proportion of immune seedlings was obtained when immune plants were selfed, while the proportion of immune seedlings obtained by selfing commercial varieties was very variable.

1879 *North, C. & Frith, L. H. Variety trials of vegetables in Scotland. IV. Summer spinach at Invergowrie 1956–1957.* (*pp. 48–51*).

The results of trials with nine varieties indicate a close relationship between yield of leaf and rate of bolting, a delay of one day in bolting giving a yield increase of 2·4 cwt./acre in 1955 and 9·3 cwt./acre in 1956. Outstanding yields were obtained from the Swedish variety Verina

OJO/53, while Moorman had the best type of leaves, held away from the soil surface.

1880 Neumann, D.
Wuchs- und Ertragserhebungen im Obstbau. (**Collections of data on growth and yield in fruit cultivation**).
Arch. Gartenb. 1958 : **6** : 3–11.

Proposals are made for uniform methods of investigating the performance of fruit trees in respect of yield and growth, such enquiries being of importance in judging varieties.

48th Annual Report of the Northern Nut Growers Association. Annual Meeting held at Mansfield, Ohio, August 19-21, 1957 : Pp. 112.

1881 *Berry, F. H. Walnut anthracnose—its cause and control.* (*pp. 16–27*).

Varieties of black walnut which have been found resistant to *Gnomonia leptostyla* at Beltsville, Md., are listed; susceptible varieties are also mentioned. The results of fungicide trials, involving several varieties, are reported.

1882 *Sherman, L. W. My best black walnut varieties.* (*pp. 31–33*).

The Lisbon walnut is considered to be best for Mahoning County, Ohio; it has withstood severe winter weather. The large nuts are fine flavoured and are said to have exceptional cracking qualities. Brown is similar to Lisbon; Tritten, a smaller nut, is also recommended but is difficult to crack without crushing the kernel.

1883 *Armstrong, W. D. Recent pecan and other nut developments in Kentucky.* (*pp. 41–45*).

A brief mention is made of varietal testing of pecans and other nuts in this general account of nut growing in Kentucky.

1884 *Talbott, J. E. The American persimmon as we see it.* (*pp. 45–51*).

Brief descriptions are provided of the performance of some persimmon varieties being cultivated at Linton, Ind. Early Golden and Killen have been most productive and their quality is good. It is thought that the so-called seedless varieties only produce seedless fruit when pollinated by a tree with a different chromosome number.

1885 *McKay, J. W. & Crane, H. L. Yields and leaf spot ratings of hickories in Beltsville plantings, 1949–47.* (*pp. 61–65*).

Lingenfelter, Schinnerling and Shaul, varieties of *Carya ovata*, were superior to other varieties tested in yield and resistance to *Gloeosporium caryae*. Some wild species of hickory and some seedlings of the shagbark variety Vest and of *C. cordiforme* are also mentioned for their high resistance to leaf spot. It is suggested that disease-resistant forms of hickory be crossed with improved pecan varieties.

1886 *Graves, A. H. Chestnut breeding—report for 1957.* (*pp. 76–87*).

At the Connecticut Agricultural Experiment Station, further interspecific hybridization has been carried out [cf. XXVII, 4413]. Lists are provided of the good and bad contrasting characters which appear to be hereditary.
Instances of self fertility in chestnut are reported; the trees involved are thought to have the pedigree (*Castanea crenata* x *C. pumila*) x *C. crenata*.

1887 *McDaniel, J. C. The pollination of Juglandaceae varieties. Part II: notes during 1957.* (*pp. 83–93*).

Observations on flowering in cultivated varieties growing at Urbana, Ill., are reported; some information on varieties grown elsewhere is also included. [Cf. XXVII, 4416].

1888 Hilton, R. J., Lancaster, O. D. & Knowles, R. H.
Small fruit growing in Alberta.
Bull. Univ. Alberta 1958 : No. 54 : Pp. 43.

Descriptions are provided of varieties of strawberry, raspberry, red, white and black currants, gooseberries and grapes recommended for cultivation in Alberta.

1889 Sági, F.
Néhány bogyósgyümölcsű terméseiben előforduló szerves savak, cukrok és színanyagok papírkromatográfiás vizsgálata. (**Investigation of organic acids, sugars and pigments in some small fruits by means of paper chromatography**).
Növénytermelés 1958 : **7** : 53–62.

At Fertőd, Hungary, interspecific and intervarietal differences in the above constituents in species and hybrids of *Rubus* and *Ribes* could be detected by means of paper chromatography.

The use of the method in selection for quality and flavour is indicated.

1890 RADU, I. F., PANDELE, I. & ENĂCHESCU, G.
Corelaţii între componentele chimice ale fructelor la maturitatea de consum. **(Correlations between the chemical components of fruits ripe for consumption).**
Bul. şti. : Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 351–72.

The fruits of an extensive series of varieties of apple, pear, quince, apricot, peach, plum, cherry, strawberry and *Ribes* have been analysed for dry-matter content, sugars, acidity, tannoids, pectins, crude protein, ash and ascorbic acid. It has proved possible to attribute some aspects of flavour to the relative proportions of various of these components, in particular the ratios between sugar content and the other substances. However it has not been possible to explain the superior taste of some of the varieties of best flavour in terms of the analyses described.

1891 KEMMER, E. & STECKEL, W.
Zur Frage der Veränderung von Holzfrostschäden bei Obstgehölzen. **(The question of variation in damage caused by frost in the wood of fruit trees).**
Züchter 1958 : **28** : 237–41.

Frost damage was studied in a large number of fruit trees of various species at the Institute for Fruit Cultivation of the Technical University, Berlin. The first investigation was made in the spring of 1956 after weather conditions particularly favourable to frost damage, the second investigation being made in the autumn of 1957. In each case a slice of bark was removed from the south side of the tree trunk and the damage graded according to the discoloration of the underlying tissues. Whereas about half the trees appeared damaged in 1956, only about 27% showed damage in 1957. Recovery from frost damage was greater in the apples than in pears, plums and sour cherries. The variety of the scion and rootstock, the age and the external conditions all seemed to influence the degree of initial damage and the capacity to recover.
The importance of investigating frost damage some time after the initial injury is emphasized, for only in this way may varietal differences in overcoming frost damage be ascertained.

1892 BÖHM, H.
Zum Vorkommen der Mittelmeerfruchtfliege, *Ceratitis capitata* Wied., im Wiener Obstbaugebiet. **(The occurrence of the Mediterranean fruit fly, *C. capitata* Wied., in the fruit-growing area of Vienna).**
PflSchBer. 1958 : **21** : 129–58.

Differences were noted between varieties of apples and pears as regards susceptibility to *C. capitata*.

1893 JOHANSSON, E.
Sort- och grundstamförsök med äpple i Sverige 1942–1957. **(Trials of apple varieties and rootstocks in Sweden, 1942-1957).**
Medd. Trädgårdsförs. 1958 : No. 113 : Pp. 40.

Results of trials at several stations in Sweden are reported. Of the rootstocks tested, the Alnarp selections A2 and A5 and the Malling Stocks MVII and MIV are provisionally recommended to growers in Sweden.

1894 **Apple tests speeded.**
Amer. Nurserym. 1958 : **108** : 121–22.

At the Experiment Station of Cornell University in Geneva, NY., a procedure has been developed which reduces the time required for testing new apple hybrids. The seeds are planted in individual pots and chromosome counts are made from root sections of the seedlings. In this way, it is possible to make a very early selection of the triploid forms, these being most likely to have superior qualities. Buds from the selected seedlings are placed on dwarfing rootstocks, thus increasing the number of trees of the original seedling; when these start bearing, there is enough fruit available for the quality to be immediately evaluated. Using this technique, fruit has been obtained from promising selections of a cross between Northern Spy and Delicious made in 1943.

1895 UL'JANIŠČEV, M. M.
(The apple variety Rossošanskoe Polosatoe).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 11 : p. 57. [Russian].

Rossošanskoe Polosatoe [Rossoš' Striped], from open pollination of Croncels, is winter hardy and productive of large greenish-yellow fruits with dark red stripes. The consistency and flavour of the flesh are those of a fine south European variety.

1896 KORDON, R. JA.
(New apple varieties obtained from open pollinated seed of Bel'fler Kitajka).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. 4 : 45–47. [Russian].

Ten seedlings of Bel'fler Kitajka [Bellflower crab] from Pavlovsk which have reached an advanced trial stage or are recommended for testing are described. Among the former are Paškeviča Krasnoe [Paškevič's Red], Ljubimica Tarasenko [Tarasenko's Favourite], Krjukovskoe, Novogodnee [New Year], Kordonovka and Sigovskoe. All these ripen in September, produce fruits weighing 135–160 g., are winter hardy and show resistance to insects and diseases. The flavour of all is good and Novogodnee keeps until March. Good pollinators for some of the varieties are named.

1897 SMYSLOV, V. K.
(A few more remarks about the names of varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 9 : p. 62. [Russian].

Improvements in varietal nomenclature, especially of apple varieties, are urged. The names of foreign varieties should not be translated into Russian but transliterated phonetically.

1898 JULIEN, J. B.
Cytological studies of *Venturia inaequalis*.
Canad. J. Bot. 1958 : **36** : 607–13.

A haploid number of 7 has been found for this fungus, with meiosis occurring at the first two nuclear divisions in the ascus.

1899 NEUMANN, D.
Beiträge zur Statistik der Wuchs- und Ertragsleistung von Obstbäumen. **(Contributions to the statistics of the performance of fruit trees in respect of growth and yield).**
Arch. Gartenb. 1958 : **6** : 23–87.

The results are reported of studies on the relation between growth rate and productivity in a series of apple variety and rootstock combinations; the variability of growth characters and yield was also investigated. With reference to the results of these statistical studies, suggestions are made for the organization of fruit-tree trials.

1900 **The Directors Report of the Arnold Arboretum during the fiscal year ended June 30, 1958.**
J. Arnold Arbor. 1958 : **39** : 494–513.

It is reported that mature trees of *Malus sikkimensis*, *M. toringoides* and an *M. sargentii* hybrid usually breed true from seed when open pollinated but occasionally produce some segregates, which have large flowers and fruits. The trees were found to be triploid and maternal type progeny are also triploids; the large-fruited types are tetraploids. It appears that the triploid parents are facultative apomicts but occasionally produce sexual segregates arising from a triploid egg cell and a haploid pollen grain from a diploid species; such progeny resembles the maternal parent on account of the excess maternal chromosomes. When triploid *M. sargentii* var. *rosea* was pollinated by a diploid species, the progeny ranged from nearly diploid to approximately tetraploid; sexual progeny of tetraploid *M. sargentii* are triploids.

1901 SÖRGEL, P.
Untersuchungen über die Abhängigkeit der Verbreitung verschiedener Obstarten und Apfelsorten von ökologischen Faktoren. Dargestellt am Beispiel des Regierungsbezirkes Unterfranken. **(Investigations on the dependence of the distribution of various fruit species and apple varieties on ecological factors. As shown in the example of the district of Unterfranken).**
Mitt. Klosterneuburg 1958 : **8** : 214–36.

Temperature and rainfall had marked effects on the distribution of the fruits studied. Two groups of apple varieties were distinguished; one was most widespread in regions of relatively high rainfall and the other was least frequent in these parts.

1902 BAUDEWIJN, J.
La fabrication des compotes de pommes, essai comparatif de la valeur de quelques variétés. **(Stewing of apples, a comparative trial of the value of some varieties).**
Rev. Agric. Brux. 1958 : **11** : 567–74.

Of the 13 popular varieties tested, Cox's Orange was found to be most satisfactory for stewing; in general the best table varieties gave the best results after stewing.

1903 DŽENEEV, S. JU.
(The development of the fruit in apple in connexion with the pollen-parent variety).
Agrobiologija (Agrobiology) 1958 : No. 3 : 129–31. [Russian].

Experiments at the Crimean Agricultural

Institute showed that the quality of fruit, in particular its size and chemical composition, is associated with the variety supplying the pollen. Data on fruit weights and the contents of sugars, acids, dry matter and vitamin C for a few varieties which had been open-pollinated or fertilized by another variety are presented.

1904 EMMERT, F. H.
Hardiness studies of apple twigs and blossoms.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–784 : 1926–28. (Abst.).

Arrangement of varieties according to the percentage of the total electrolyte content of the twig which escaped from the tissues as a result of low-temperature injuries corresponded closely to the order based on reports of actual winter injury. Differences in electrolytically determined hardiness of 55 varieties tested in autumn agreed well with generally accepted differences. Degree of hardiness differed, however, in autumn, midwinter, late winter and early spring, most of the hardy varieties showing a decrease and most tender varieties an increase in hardiness with season; some varieties showed little change with season and others irregular changes. The varieties which appeared to be most hardy throughout the dormant season included Bedford, Virginia Crab, Saffron Antonovka, Anaros, Columbia, Hibernal, Mecca x Dolgo, Red Yorking, Colora and Antonovka.
In studies of blossom hardiness, the stamens were the most hardy tissue throughout the blossom period; the style was the most tender and the ovary wall intermediate, except in the prepink stage of development. Varietal and seasonal differences in hardiness of all three tissues were found. Baldwin was generally hardy throughout the season and Hibernal hardy towards the end of the season, while the other varieties were usually of medium hardiness throughout the season.

1905 WILNER, J.
Winter hardiness research.
Res. Frmrs., Ottawa 1958 : **3** : No. **4** : 8–10.

With a view to breeding for hardiness in apples and other tree fruits, the possibility of evaluating seedlings by means of electrolytic and other methods is being explored at the Central Experimental Farm, Ottawa. The electrolytic technique is considered to be promising.

1906 GOLLMICK, F.
Beobachtungen über Frostschäden an Wildäpfeln und ihren Sämlingen als Folge der strengen Frostperiode im Februar 1956. (**Observations on frost damage on wild apples and their seedlings resulting from the severe period of frost in February 1956**).
Arch. Gartenb. 1958 : **6** : 126–49.

These observations, carried out at Naumberg, Germany, revealed that early-flowering forms of *Malus* on the whole suffered more damage by frost than later types. A study of F_1 hybrid progenies showed that frost resistance is inherited. The data also indicated that, in addition to the hereditary factors regulating development, there are other factors which are also involved in determining the sensitivity to cold.

1907 SEWELL, G. W. F. & WILSON, J. F.
Resistance trials of some apple rootstock varieties to *Phytophthora cactorum* (L. & C.) Schroet.
J. hort. Sci. 1959 : **34** : 51–58.

Marked differences were observed in the resistance of rootstocks of the Malling, Malling-Merton and M.IX series to *Ph. cactorum* and in the pathogenicity of different isolates. Several rootstocks displayed a high degree of resistance comparable with that of M.II.

1908 SIEBS, E.
Ergebnisse zu Problemen des Mehltaus und der Mehltauresistenz des Apfels. I. Mehltau. (**Results concerning problems of powdery mildew and the resistance of apples to powdery mildew. 1. Powdery mildew**).
Phytopath. Z. 1958 : **34** : 86–102.

The artificial infection of apple trees with *Podosphaera leucotricha* is known to present certain difficulties. In investigations carried out at Köln-Vogelsang, a method was found to be satisfactory in which young leaves are detached from trees, inoculated and kept in moist, closed Petri dishes during the incubation period of the fungus. Using this procedure, several varieties that have proved very difficult to infect in the orchard were shown to be susceptible. The existence of several physiological races of *P. leucotricha* was demonstrated in a series of cross inoculation experiments. It seems unlikely that these races arose by sexual reproduction seeing that perithecia are seldom formed; the races probably originated by the fusion of genetically different mycelia.

Investigations on culturing *P. leucotricha* were also carried out and suggestions are made as to why it has hitherto been impossible to culture this fungus *in vitro.*

1909 Lusis, E.
Untersuchungen über das spezifische Gewicht bei Äpfeln und Birnen. (**Investigations on the specific weight of apples and pears**).
Arch. Gartenb. 1958 : **6** : 91–125.

Specific-weight determinations are recorded for a series of German apple varieties. The variation coefficient of specific weight was about ten times smaller than that of absolute weight; age and locality did not influence specific weight. All the apple varieties showed a negative correlation between absolute weight and specific weight. Some pear varieties were also studied; both negative and positive correlations between absolute and specific weight were found.

1910 (**The pear variety Gornaja Krasavica**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **10** : p. 62. [Russian].

Gornaja Krasavica [Mountain Beauty] (Lesnaja Krasavica [Forest Beauty] x Bere Zimnjaja Mičurina [Mičurin's Winter Beurré]) is mentioned for its winter hardiness. The fruits have attractive appearance and their flavour is good. They weigh 140 g. each and keep for 60–65 days.

1911 Karanjan, P. G.
(**The pear variety Pamjat' Mičurina**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **10** : p. 62. [Russian].

Pamjat' Mičurina [Mičurin's Memorial] arose from the same cross as Gornaja Krasavica [cf. 1910] and has similar characteristics; the fruit weighs 170 g. and keeps for 35–40 days.

1912 Drain, B. D. & Safley, L. M.
Morgan and Carrick—two blight-resistant pears.
Bull. Tenn. agric. Exp. Sta. 1958 : No. 263 : Pp. 10.

Further information on the above varieties, respectively developed from Bartlett x Late Faulkner and Seckel x Garber, is provided [XXVIII, 4629].

1913 Ostapenko, V. I.
(**Some indices of the oxidizing processes at fertilization in intervarietal and distant crossings of stone fruits**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 296–306. [Russian].

An extended account of a report already summarized is given [XXVII, 2164].

1914 Baldini, E.
Contributo allo studio delle cultivar di susino. (**Contribution to the study of the plum cultivars**).
Riv. Ortoflorofruttic. ital. 1958 : **42** : 390–423.

This is the last part of an article referred to earlier [663]. It contains tables in which the 46 cultivars are arranged in order of vigour, flowering time, self compatibility, size, colour and type of fruit, yield, time of ripening and suitability for use in the fresh or dried state. Finally there is an alphabetical list of all the synonyms established by the study.

1915 Vdovceva, T. A.
(**A description of pollen growth after crossing peach with the cultivated plum**).
Agrobiologija (Agrobiology) 1958 : No. 2 : 133–36. [Russian].

Observations on the growth of pollen tubes in direct and reciprocal crosses between plums and peaches, where the pollen was provided by single varieties or mixed varieties, are reported. Evidence suggests that retarded growth of the pollen tubes in the style is responsible for the failure to fertilize the ovules.

1916 Paunović, S. A.
Wzajemne stosunki między zrazem i podkładką przy oczkowaniu śliwy odmiany Požegacza na siewkach różnych lokalnych śliw jugosłowiańskich i na *Prunus Myrobolana.* (**Reciprocal relationships between stock and scion in grafting the plum variety Požegača on seedlings of different local Yugoslavian plums and on *P. Myrobolana***).
Prace Inst. Sadownict. Skierniewicach 1957 : **2** : 121–29.

Grafting trials with the above variety showed that myrobalan was the best rootstock and that Ilinjača, Petrovača [plum from Petrovac], Požegača [plum from Požega] and Beloslijva [White plum] were best among the nine local varieties tested as rootstocks.

1917 Łęski, R.
Studia nad szkodliwością i zwalczaniem owocnicy żółtorogiej (*Hoplocampa minuta* Christ). [**Studies on the damage caused by the plum sawfly (*H. minuta* Christ) and its control**].
Prace Inst. Sadownict. Skierniewicach 1957 : **2** : 167–93.

Varietal differences in susceptibility to the above pest were found but no relation between infestation and morphological and physiological characters could be detected.

1918 GERRITSEN, C. J.
Zijn er in Nederland mogelijkheden voor de teelt van buitenperziken? (**Are there possibilities for the culture of outdoor peaches in the Netherlands?**)
Meded. Inst. Vered. TuinbGewass. 1958 : No. 124 : Pp. 25.

Outdoor peach is regarded as a promising fruit crop for the Netherlands and trials of varieties and rootstocks have been established in various regions.

1919 HOUGH, L. F. & BAILEY, C. H.
Goldgem and Summerqueen, two new peaches from New Jersey.
Fruit Var. hort. Dig. 1958 : **13** : 5–6.

Additional information is given on the above varieties which were developed from J. H. Hale x Cumberland [XXVIII, 2149].

1920 **Earlihale peach.**
Fruit Var. hort. Dig. 1958 : **13** : p. 2.

Released jointly by the US Department of Agriculture and State College of Washington, Earlihale is a selfed seedling of Burbank July Elberta. Its medium to large fruits are yellow-fleshed and freestone, ripening at the same time as Halehaven and in appearance resembling J. H. Hale. Like its parent, the variety has a fairly low chilling requirement.

1921 KRAMER, S.
Durch Selektion zu höheren Erträgen und besserer Qualität im Pfirsichanbau. (**Through selection to higher yields and better quality in peach cultivation**).
Deutsch. Gartenbau 1958 : **5** : 209, 216–17.

Considerable variation is found between individual trees of peach varieties. Mention is made of variation in fruit size, maturity date, frost resistance and other characters in seedlings of such varieties. It is suggested that the performance of peaches may be improved in the following ways: (1) Individual selection of promising trees from existing stands of seedling varieties and vegetative propagation of these selections; and (2) individual selection with progeny testing and sexual propagation of promising progeny, illegitimate pollination being prevented. Trees should be named in a way that will indicate whether they originated from seed or were vegetatively produced.

1922 TAYLOR, J. W.
Mutations of late maturity in peaches and nectarines.
Fruit Var. hort. Dig. 1958 : **13** : 3–5.

In California, three late-maturing mutants have been found in commercial orchards of the peaches Elberta, Rio Oso Gem and the nectarine Le Grand respectively. They show promise as a means of extending the season of ripening.

1923 TUZ, A. S.
(***Prunus ferganensis***).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : 57–58. [Russian].

Mention is made of peaches and nectarines selected among *P. ferganensis* forms from a collection at the Šreder Institute. They include large-fruited, late flowering or winter-hardy forms and all are resistant to *Sphaerotheca*. Brief descriptions of the fruit of Cling ferganensis 1 and the nectarines Ferganensis 1 and Ferganensis 2 are given. The peach and one of the nectarines are self sterile.

1924 T., H. B.
Fruit talk.
Amer. Fruit Gr. 1958 : **78** : No. 8 : p. 30.

A brief mention is made of Elbertita, a semi-dwarf, yellow-fleshed, clingstone peach bred in New Jersey.

1925 **New peach, Tejon.**
Amer. Nurserym. 1958 : **108** : No. 4 : p. 86.

This early maturing peach has been developed at the University of California at Riverside. It is one of the earliest yellow-fleshed peaches and is well adapted to regions with warm winters, where it does not suffer from lack of winter chilling. The fruit is of fair size and good quality, when grown in warm climates. Tejon will be available in 1959.

1926 ČEREVATENKO, A. S. & ČEREVATENKO, V. A.
(**Own-rooted peaches**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : 45–47. [Russian].

Economic advantages of growing peaches on their own roots in Uzbekistan are discussed and varieties which give a high proportion of seedlings with the characters of the trees providing the stones are named. These include the recent varieties Farhad, Start, Lola, Krasnovostočnyj [Red Eastern] and especially the old variety Ak-Šaftalju 1 [White peach 1] which breeds 100% true to type.

1927 Štampar, K. & Gliha, R.
Prilog poznavanju kemijskog sastava bresaka. (**A contribution to the study of the chemical composition of the peach**).
Poljopr. Znanst. Smot. 1957 : **16** : 91–116.

The results are reported of studies carried out at Zagreb, Yugoslavia, on the chemical composition of six peaches. Marked intervarietal differences were observed; early varieties were less rich in sugar than midsummer varieties. The acid content did not depend on the maturity period. Investigations were also made on the influence of the climate on the chemical composition of the fruit.

1928 Rjadnova, I. M.
(**Seedlings of cultivated peach varieties in the Kuban'**).
Agrobiologija (Agrobiology) 1958 : No. 2 : 42–45. [Russian].

The results of breeding peaches for hardiness at Krymskaja, Krasnodar territory, are reported. The hardiest among open pollinated seedlings were from a local variety from the Slavjanskaja district, the Georgian variety Bestavašvili, the Armenian variety Pauni and Elberta. Mention is also made of the hybrids Zolotoj Jubilej [Golden Jubilee] x Pauni and Arp Beauty x Mami Ross; both are crosses between different ecotypes; they are winter hardy and have large fruit with yellow flesh and free stones. Their flavour is good and they ripen in August.

1929 Klotz, L. J., DeWolfe, T. A. & Wong, P.-P.
Influence of 2 varieties of citrus scions on the pathogenicity of 3 isolates of *Phytophthora parasitica* to sweet orange rootstock.
Phytopathology 1958 : **48** : 520–21.

Rootstocks of the sweet orange Madam Vinous inoculated with any one of three different isolates of *Phytophthora parasitica* showed significantly smaller lesions with Washington navel orange as scion than with Lisbon lemon. The three isolates differed in virulence.

1930 Cameron, J. W., Soost, R. K. & Frost, H. B.
Effects of genetic and nongenetic change in nucellar seedling lines of Satsuma mandarin.
Citrus Leaves 1956 : **36** : No. 11 : 8–9, 20, 26.

Two nucellar seedlings studied show larger tree size and yields than the parent tree, as is characteristic of nucellar lines derived from old varieties, but in addition they appear to differ genetically from each other in tree habit, fruit shape and probably leaf size. They are designated strains A and B, and other seedlings from the same parent all appear to belong to one or other of these two types. The differences between A and B are attributed to the occurrence of one or more bud mutations in the parent tree. Strain A is of greater value than either B or the parent line.

1931 Singh, R. N.
Mango breeding.
Hort. Advanc., Saharanpur 1957 : **1** : 23–33.

After reviewing previous work in this field and discussing the aims of a mango breeding programme, the author describes work carried out at the Horticultural Research Institute, Saharanpur, Uttar Pradesh, India. The nine varieties used in the breeding programme are briefly described and details are given of the technique used for carrying out cross pollination. From more than 9000 crosses, 23 hybrids were obtained and eight of the most promising are described in detail, illustrated and compared with their parents. Further testing will be required to determine the commercial value of the new hybrids.

1932 Kalmykov, S. S. & Sabirov, M. K.
(**Early fruiting walnuts**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 9 : 64–66. [Russian].

Mention is made of the variety Ideal and other hardy early-fruiting bush types which have been selected from local trees at the Bostandyk Field Research Station, Taškent province. The early fruiting habit is transmitted to all vegetative and nearly half the sexual progeny. Among the recent selections is a seedling of Ideal, Uzbekskij Skoroplodnyj [Uzbek Early-fruiting]. It has nuts weighing 11·57 g. each, the kernel percentage being 54·5%. It is characterized by great hardiness and a high regular annual yield.

1933 Evreinoff, V. A.
Contribution à l'étude des noisetiers. (**A contribution to the study of hazels**).
J. Agric. trop. Bot. appl. 1958 : **5** : 274–96.

Descriptive notes are provided on species and varieties of *Corylus*; mention is also made of the distribution, cultivation and paleobotany of the genus. An account is presented of the complex flowering and pollination behaviour of this genus.

1934 Gerritsen, C. J.
De amandel. (**The almond**).
Meded. Dir. Tuinb. 1958 : **21** : 771–73.

In studies of almond varieties at the Netherlands

Institute of Horticultural Plant Breeding, only the variety 5404 was sufficiently hardy for Netherlands conditions. Thought to be a peach x almond hybrid, it has hard stones and rather small but sweet kernels. It is recommended to private growers.

1935 SCARAMUZZI, G.
Secondo contributo allo studio del "mosaico" del mandorlo; in Puglia. Ulteriori ricerche sperimentali sulla malattia ed esperienze preliminari per la individuazione di "ceppi" virosici responsabili dei suoi sintomi. (**Second contribution to the study of almond mosaic in Puglia. Further experimental research on the disease and preliminary experiments on defining the virus races responsible for its symptoms**).
Atti Ist. bot. Univ. Pavia : Ser. 5 : 1957 : **14** : 156–73.

All but one of the eleven types of mosaic symptoms studied proved to be transmissible by grafting and are ascribable to the mosaic-virus complex. The one exception is considered to be a bud mutation. The remaining ten could be arranged in four distinct groups corresponding to four strains of the virus, the precise symptoms produced by each strain differing according to the almond cultivar on which it was tested.

1936 SCARAMUZZI, G.
Terzo contributo allo studio del "mosaico" del mandorlo in Puglia. Indagine sulla diffusione della malattia e sulla suscettibilità delle cultivar nella zona di Cassano Murge (Bari). [**Third contribution to the study of almond mosaic in Puglia. Study of the distribution of the disease and on the susceptibility of the cultivars in the zone of Cassano Murge (Bari)**].
Atti Ist. bot. Univ. Pavia : Ser. 5 : 1957 : **14** : 329–38.

Data are given showing the degree of infection of a number of almonds growing in this area of southern Italy. The 29 cultivars examined could be arranged into three groups differing in susceptibility, the differences being most evident in the early part of the growing season, in May or early June. Even Rachele, the cultivar classed as least susceptible, had a percentage infection of 26, compared with 89% for Montrone, the most susceptible.

1937 MAZZANI, B. & COBO, M.
Características varietales del maní. (**Varietal characteristics of the groundnut**).
Agron. trop., Venezuela 1957 : **7** : 109–49.

Tabulated data and notes are presented on 201 varieties grown in the collection at the Maracay Centre of Agronomic Investigations, Venezuela. The diagnostic characters used are: branching, vegetative habit, leaf size, growth period, number of seeds per fruit, kernel percentage, 100-fruit weight, fruit shape, testa colour, 100-seed weight and dormancy.

1938 LIYANAGE, D. V. & ABEYWARDENA, V.
Correlations between seed-nut, seedling and adult palm characters in coconut.
Trop. Agriculturist 1957 : **113** : 325–40; and Bull. Cocon. Res. Inst. 1958 : No. 16 : Pp. 16.

With a view to promoting efficiency in the selection of parents for the purpose of seed propagation, correlations between 14 characters of the seed nut, seedling and adult palm were determined at the Coconut Research Institute, Ceylon.

1939 **Annual Report of the Coconut Research Board of the Coconut Research Institute for 1956.**
Ceylon 1958 : Sess. Pap. 6 : Pp. 67.

Data are provided on the number of nuts harvested and the husked-nut weights of a series of *typica* x *nana* hybrids; these yields are considered to be satisfactory. The hybrids seem to be as hardy as the *typica* parent and were not affected by a severe drought. Hybridization between selected *typica* forms was continued and various other intervarietal hybrid seedlings are being studied to find how far hybrid vigour is expressed in first-generation progenies. In a progeny trial planted in 1934, 281 offspring of nine high-yielding mother palms have been tested; data are provided on the mean yield of nuts per year of the offspring during the 15th to 19th year after transplantation. No correlation was shown between the yield of a mother palm and its offspring. Variation in yield between offspring of a single family is considerable but two families having the highest progeny means show much less variation than the other families. The two mother palms in question seem to be less heterozygous with respect to yield than the other palms.

Similar results were obtained in another trial of 125 progenies from 20 mother palms, the progenies being 17 years old; in this experiment three families were found to be particularly high yielding. A further report is presented on a study of different methods of seed and seedling selection [cf. XXVI, 1758]. During 1955 and 1956 the unselected seedlings of high-yielding mother palms have given 821 nuts or 3·92 cwt. of copra per acre per year less than the selected seedlings from similar seed, the difference being statistically significant. Correlations were worked out between various characters when the palms were 16 and 17 years old. The weight and volume of a seed nut and the weight, root number, leaf number and height of a seedling have generally shown no influence on the flowering period or the yield of copra of the adult palm. Progenies of palms with heavy or large nuts produce fewer nuts than those bearing smaller nuts; for any particular parent, the weight and volume of the seed nut does not influence differences in yield between progenies. The flowering period is negatively correlated with yield of nuts and copra, the coefficients being highly significant both " 'between' parents and 'within' parents". Attempts to induce polyploidy by applying colchicine solution to meristematic tissues of seedlings or by injecting colchicine into nuts were unsuccessful.

1940 Bachy, A. & Hoestra, H.
Contribution à l'étude de la "maladie de Kaïncopé" du cocotier au Togo. (**A contribution to the study of the Kaïncopé disease of the coconut in Togo**).
Oléagineux 1958 : **13** : 721–30.

The Kaïncopé disease, known in Ghana as Cape St. Paul wilt, is compared with other coconut diseases of unknown origin. Two dwarf trees situated in an infected region have shown no symptoms but it is not yet known whether or not dwarfing is associated with resistance to the disease. It is hoped that crosses between dwarf and ordinary varieties will be resistant; such hybrids are promising in respect of earliness and productivity.

1941 Pratt, C., Einset, J. & Clausen, R. T.
Embryology, breeding behavior and morphological characteristics of apomictic triploid *Rubus idaeus* L.
Bull. Torrey bot. Cl. 1958 : **85** : 242–54.

A triploid red raspberry growing wild at Ithaca, NY, was found to be intermediate in its gross morphology between *R. idaeus* subsp. *idaeus*, as represented by the autotetraploid Hailsham, and wild plants of *R. idaeus* subsp. *strigosus* growing in the central region of New York state.

Embryo-sac development in the triploid was compared with that in *R. idaeus* subsp. *strigosus* and the horticultural diploid variety, Milton. Apospory occurred in the triploid but there was little or no tendency towards apospory in the two diploids.

The fruit set of the triploid following open pollination averaged 30% whereas in Milton and tetraploid *R. idaeus* subsp. *idaeus* it was 58% and 40% respectively. Low fruit sets were obtained after self pollination of the triploid and after cross pollination with diploid or tetraploid raspberries and blackberries. No drupelets formed when flowers were emasculated but not pollinated, indicating that pollination is necessary for fruit set.

Chromosome counts were made of progenies of the triploid raspberry. Of the seedlings of open-pollinated origin, 88% were triploid; 77% of the seedlings having a diploid red raspberry as the male parent were also triploid. These seedlings are thought to have originated by parthenogenetic development of unreduced egg cells. One seedling of triploid *R. idaeus* x tetraploid Eldorado blackberry had approximately 21 chromosomes and appeared to be a hybrid. The occurrence of three raspberry-type seedlings with 35 chromosomes suggested that unreduced egg cells may also develop after fertilization by a 14-chromosome gamete from a red raspberry. A seedling of triploid *R. idaeus* x tetraploid Erie blackberry was diploid and of the raspberry type. Diploid seedlings occurred more frequently when the triploid was pollinated by a diploid than when the pollen parent was tetraploid; this indicated that some of the 14-chromosome seedlings were the result of fertilization. Seedlings with 15 or 19 chromosomes also occurred. Most of the progeny resulting from pollination by tetraploids also had 28 chromosomes; the majority of these seedlings died but six survived and showed hybrid characteristics.

It is suggested that the triploid studied arose as a hybrid between *R. idaeus* subsp. *idaeus* and *R. idaeus* subsp. *strigosus*, a 14-chromosome gamete having united with a 7-chromosome gamete.

1942 Wassenaar, L. M.
Ervaringen en rassenonderzoek met zwarte bessen. (**Experiences and varietal trials of black currants**).
Fruitteelt 1958 : **48** : 1043–44, 1047.

Data obtained at stations in the Netherlands are given on times of flowering and maturity, degree of shedding, damage by night frosts and quality of fruits for seven established varieties and 11 regarded as in need of further testing. Yields vary considerably from locality to locality.

1943 Dement'eva, M. I.
(Biochemical and physiological factors governing the resistance of the gooseberry to mildew).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Akad.) 1958 : No. 5 : 149–60. [Russian].

Differences in biochemical, physiological and anatomical characteristics between *Sphaerotheca*-resistant and susceptible varieties are described. Resistant varieties such as Haughton have a higher peroxidase activity in the leaves and lower catalase activity; their berries have a higher content of acids and less sugar. The pH of the leaves and berries of resistant varieties is below that of susceptible ones; resistant varieties are also distinguished from susceptible by less widely open stomata, a lower transpiration rate and a thicker cuticle.

1944 Larsson, G.
Jordgubbsförsök vid Öjebyns försöksstation 1954–1957. **(Strawberry trial at the Öjebyn experimental station, 1954-1957).**
Medd. Trädgårdsförs. 1958 : No. 112 : Pp. 9.

In trials of eight varieties at the above station, situated on the Swedish coast between 65° and 66° N., Abundance Wannberg, Ydun and Indra were the most productive, the last-mentioned yielding slightly less than the other two but being best in quality.

1945 Kronenberg, H. G.
Balans van ervaringen met nieuwere aardbeirassen in de open grond. **(Assessment of experiences with recent strawberry varieties in the open).**
Fruitteelt 1958 : **48** : 1086–88.

Data on susceptibility to damage by winter frosts, night frosts, unfavourable weather during flowering, fruit rot and viruses are given for four early, eight midseason and two late varieties grown in the Netherlands, together with information on soil preferences, yield and other characters.

1946 Berger, R.
Station de démonstration et d'essais du fraisier à Rongy. Résultats de la saison 1956/1957. **(The Station for Demonstrating and Testing Strawberries at Rongy. Results of the 1956/1957 season).**
Rev. Agric., Brux. 1958 : **11** : 743–803.

Full details of the agronomic and quality characters of a series of strawberry varieties tested at Rongy, Belgium, are presented in tabular form.

1947 Viehmeyer, G.
The Ogallala Strawberry.
Neb. Exp. Sta. quart. 1958 : p. 15.

This new variety released jointly by the North Platte Experiment Station of the University of Nebraska and the US Department of Agriculture is descended from a wild strawberry collected in the Rocky Mountains. Other varieties, including Fairfax, Midland and Rockhill, were involved in the hybridization programme which produced Ogallala. From its wild parent, Ogallala has inherited hardiness and mild aroma; its flavour is outstanding. Fruit size equals that of cultivated varieties; the flesh is dark red and without a lighter coloured core. The flesh is not sufficiently firm for this variety to be suitable for transport. Ogallala is however suitable for canning and freezing. High yields are produced from May until late October at North Platte. The plants of Ogallala are vigorous and the flowers are tolerant of light frost. This variety is also resistant to drought and *Mycosphaerella fragariae*.

1948 Stoitschkov [Stojčkov], J. P.
Regeneration der Achsen und Periodizität der Blütenbildung bei den einmaltragenden Erdbeersorten. **(Regeneration of the axes and periodicity of flowering of strawberries fruiting once a year).**
Mitt. Klosterneuburg 1958 : **8** : 207–13.

The varieties studied in Sofia, Bulgaria, were found to be of two kinds. The first group, which included Madame Moutot and Mieze Schindler, started their winter dormancy earlier and finished it later than the second group of varieties including St. Josef and Sharpless. The first group were less damaged by cold and gave higher yields. Differences were also observed between the groups in respect of their production of high-order stem axes.

1949 Eisenhuth, F.
Qualitätsermittlungen an Erdbeersorten und ihre Ertragsleistung auf schwerem Boden am Rande des Harzer Regenschatten-gebietes. **(Quality determinations of strawberry varieties and their productivity on heavy soil at the edge of the rain shadow belt of the Harz).**
Arch. Gartenb. 1957 : **5** : 467–503.

Methods used for determining the fruit size, transportability, intensity of colour and chemical composition of strawberries are described. Varietal tests held in the above-mentioned region are described and discussed; the general performance of the strawberries was found to be greatly influenced by weather conditions. Five varieties, which are no longer cultivated commercially, grew faster and yielded more fruit than some officially approved varieties. Details are provided of the quality characters of 24 varieties.

1950 HARLAND, S. C.
Cytogenetical investigations on soft fruits.
Progress Report of the University of Manchester, Department of Botany for the period ending 31st May 1957 : Pp. 6. (Mimeographed).

This report deals with the following investigations on *Fragaria*:—

Further study of inheritance of reaction of wild and cultivated forms of *F. vesca* to mildew has indicated that susceptibility depends on two major dominant genes, either or both of which confer susceptibility. A cytoplasmic effect has also been detected. The grade of susceptibility in the F_1 of resistant ♀ x susceptible ♂ is lower than in the reciprocal. This effect persists in the F_2 and back crosses to both parents.

The influence of chromosome number on mildew resistance in *F. vesca* may be summed up as follows: haploid, immune; diploid, partly susceptible (grade 2); and tetraploid, grade-3 susceptibility. The diploid and tetraploid were respectively obtained by colchicine doubling of the haploid and diploid.

Many commercial strawberry varieties ($8x$) previously regarded as resistant have proved susceptible. Hardwicke, Huxley and Cambridge Vigour have shown most resistance. Segregates more resistant than the parents have been noted in selfed progenies of some commercial varieties. The most susceptible octoploid is the Contulmo type of *F. chiloensis* from south Chile, and the most resistant a representative of this species from Oregon. Crosses of Contulmo with Hardwicke, Huxley and the Oregon introduction are under investigation.

Earlier work has shown that it is possible to synthesize entirely new forms by crossing Alpine forms of *F. vesca* with cultivated octoploids. This entailed doubling of the normal $2x$ form. When the hexaploids obtained by crossing the tetraploid with cultivated octoploids were hybridized with octoploids, unreduced $6x$ gametes combined with $4x$ gametes of the octoploid to give $10x$ plants. Seedlings from intercrosses of the decaploids are now under investigation. Many of the $10x$ plants are highly susceptible to mildew; this may mean that only the most resistant forms of *F. vesca* and commercial octoploids should be used for decaploid synthesis.

Since production of decaploids in this way is somewhat laborious, two other methods have received attention: (1) colchicine treatment of $5x$ seedlings from $2x$ x $8x$ and (2) hybridization of $16x$ types with $4x$ *F. vesca*. With (1), $5x$ hybrids from $2x$ *F. vesca* x $8x$ *F. virginiana* (wild strain from New Hampshire) were completely ♂ and ♀ sterile. Two seedlings were successfully doubled by colchicine treatment. Pentaploids from $2x$ *F. vesca* x $8x$ cultivated types were partially fertile, almost all the gametes being $10x$. From the few seeds derived from crosses of the pentaploids with $4x$ *F. vesca* it is hoped that $12x$ seedlings will be obtained, which, when crossed with octoploids and if unreduced gametes are absent, will give rise to decaploids. With (2), many crosses were attempted between Western Queen and $4x$ *F. vesca*, one plant being obtained from a cross with Alpine Belle de Meaux and another from a cross with Baron Solemacher Alpine Bush. Additional $16x$ types are being used.

The possibility of introducing *F. vesca* genomes at the octoploid level is being explored in two ways. (1) Utilizing pentaploids from *F. vesca* x commercial $8x$, a series of crosses has been initiated, consisting of (*a*) $5x$ x $8x$ to produce $14x$ plants as the result of fertilization of $10x$ gametes from the $5x$ parent, and (*b*) $2x$ x $14x$ to obtain octoploids. (2) The $4x$ form from $2x$ x $6x$ ($4x$ *F. vesca* x $8x$ cultivar) was treated with colchicine.

Seeds have been secured from crosses of $2x$ and $4x$ *F. vesca* as ♀ with *F. moschata* ($6x$). Doubling the chromosome number of the seedlings by colchicine treatment is to be attempted. Production of $12x$ *F. moschata* by this technique is also receiving attention.

The $8x$ cultivar San Rivale was crossed with *Potentilla anglica*, *P. erecta*, *P. fruticosa*, *P. palustris* and *P. sterilis*. Mature flowering plants ($2n = 35$) were raised from the cross with *P. fruticosa* [976]. Mature plants have also been secured from the cross of *P. fruticosa* with $10x$ strawberry.

Since induction of haploids of $8x$ cultivars and their doubling would be of considerable importance in breeding, methods of inducing such forms are being studied. In crossing with *Potentilla*, *P. fruticosa* and *P. anglica* were the most successful species in inducing ovule stimulation. The effects of using X-irradiated and aged pollen, as well as pollen of further species of *Potentilla*, are to be determined.

Perpetual flowering in Perpetual depends upon two complementary genes.

Commercial varieties are being selfed for genetical and breeding studies. Some varieties have shown little loss in vigour while others have given rise to uniformly weak progeny.

1951 Bolton, A. T.
Cultural variation in *Mycosphaerella fragariae*.
Canad. J. Bot. 1958 : **36** : 935–40.

Isolates of *M. fragariae* from various commercial strawberry varieties were found to differ in their cultural characteristics; each strawberry variety yielded a more or less distinct type of *M. fragariae*. Twenty-five types were found in varieties from Canadian and American states; *Fragaria virginiana* in different areas also yielded various cultural types of the pathogen. Variants arose in cultures on artificial media, the different types varying in their stability; also variants were found in two types after they had passed five times through hosts other than those from which they were originally isolated. It is suggested that the number of cultural types of *M. fragariae* occurring in nature is only limited by the number of varieties of the host.

1952 Osborne, R. E.
Breeding the immune banana.
Bull. Dep. Agric. Jamaica 1958 : No. 2 : 1–7.

For the benefit of the grower, breeding in the British West Indies, aimed at developing a commercial acceptable variety highly resistant or immune to Panama disease and *Cercospora* leaf spot, is outlined with reference to (1) history and organization, (2) techniques employed and problems and (3) results. Marked improvement in quality of the seedlings has been achieved but whether the promising disease-resistant seedlings now under observation will pass the rigid tests for commercial suitability remains to be seen.

1953 Geisler, G. & Staab, J.
Versuchsanstellung im Weinbau. (**Experimental design in viticulture**).
Vitis 1958 : **1** : 257–81.

Uniformity trials of Riesling vines have been analysed to study individual and mean variation, optimum size and shape of plots and blocks, and the effects of missing stocks and of replication in time and space. It is recommended that a minimum of 100 plants should be allocated to each treatment; plots for varietal trials should consist of 25–30 stocks, replicated at least 4 times. The plots can be laid out as single rows. On sloping ground, the blocks should be rectangular with the short side perpendicular to the direction of the slope. Block size should be 1000–1300 m². and trials should continue for a minimum of 5–6 years with 6 replications.

1954 Németh, M.
Borszőlőfajták összehasonlító értékvizsgálata. (**Comparative evaluation of wine-grape varieties**).
Szőlészet. Kutató Int. Évköny. 1958 : **11** : 261–326. [from Hungar. agric. Rev. 1958 : **7** : No. 3 : p. 6]. (Abst.).

A collection of 200 varieties has been established at the Ampelological Research Institute, Pécs, Hungary. A procedure for improving varieties by clonal selection in four stages over a period of 12 or more years is described.

1955 Leyvraz, H.
Sélection de la vigne et choix des sarments à greffons. (**Vine selection and choice of shoots for scions**).
Rev. rom. Agric. 1958 : **14** : 69–73.

Clonal selection, selection by elimination of unsatisfactory vines and mass selection are described. A brief account is provided of the selection of Chasselas types in French-speaking Switzerland.

1956 Constantinescu, G.
Observaţii asupra apariţiei variaţiilor mugurale la *Vitis vinifera sativa*. (**Observations on the appearance of bud variations in *V. vinifera sativa***).
Bul. şti. : Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 293–306.

Konstantinesku [Constantinescu], G.
(**Observations on occurrence of bud mutations in the vine**).
Agrobiologija (Agrobiology) 1958 : No. **3** : 139–41. [Russian].

Miscellaneous observations on somatic mutants observed since 1930 in open-air and greenhouse grapes in Rumania are recounted.

1957 Kostjuk, O. N.
(**The effect of root mentors upon vine seedlings**).
Ukrajin. bot. Ž. 1958 : **15** : No. 2 : 36–43. [Ukrainian].

New high-quality wine and dessert varieties of vine have been bred at the Ukrainian Viticultural Institute. They were obtained by training Alicante Bouchet x Cabernet-Sauvignon and other *Vitis vinifera* hybrids on such root mentors as Riparia x Rupestris 101–14. Mentor-trained hybrids fruited earlier than identical hybrids on their own roots and were more winter hardy, productive and vigorous. In most cases the mentor did not impair grape quality.

1958 Cosmo, I. & Polsinelli, M.
"Schiave". **(The Schiava varieties).**
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : xv–xlii.

Vines of this type have been known since the thirteenth century. Full descriptions are given here of Schiava gentile, Schiava grigia [Dusky Schiava], Schiava grossa [Large Schiava] and Tschaggele. All are used for wine making and the last two also for dessert.

1959 Cosmo, I. & Polsinelli, M.
"Prosecco".
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : xliv–lii.

A full description is given of the above vine, which is principally grown in Treviso. The golden yellow berries are used to produce two types of wine, a dry wine and a mild sparkling wine.

1960 Bruni, B.
"Cannonao".
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : liii–lix.

The above grape is a Sardinian form believed by some authors to be an introduction from Spain. It produces purplish-black berries and is used in the preparation of several distinctive wines.

1961 Bruni, B.
"Nasco".
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : lxi–lxviii.

This grape is practically confined to the Campidano di Cagliari in Sardinia. The berries are golden yellow, often streaked with maroon. They are used in the preparation of a dessert wine noted for its fine bouquet and flavour.

1962 Bruni, B.
"Montonico bianco". **(White Montonico).**
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : lxix–lxxv.

Though high-yielding, this grape is of inferior quality. It is grown in central Italy, the berries being yellowish streaked with maroon.

1963 Bruni, B.
"Pecorino".
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : lxxvii–lxxxiv.

The hardiness and earliness of this grape have resulted in its widespread cultivation in upland regions in Italy. The berries are yellowish, sometimes streaked with maroon, and are used to produce a light table wine.

1964 Bruni, B.
"Semidano."
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl. : lxxxv–xci.

This Sardinian vine is of sporadic occurrence. The berries are yellowish, streaked with maroon, and can be used for blending with those of the variety Nuragus in wine making.

1965 Del Gaudio, S. & Ciasca, L.
"Uva di Troia". **(Troy grape).**
Ann. Sper. agr. 1958 : **12** : No. **4** : Suppl.: xciii–xcviii.

This grape is one of the most important varieties in Puglia whither it is believed to have been introduced in early times from Asia Minor. The berries are purple and furnish a wine of the Barletta type with up to 14% alcohol.

1966 Mazzei, A. & Zappalà, A.
"Carricante".
Ann. Sper. agr. 1958 : **12** : No. **5** : suppl. : xxix–xxxv.

The variety described is the most widely grown white grape in the Catania province of Sicily; it produces an aromatic white wine of good quality.

1967 Mazzei, A. & Zappalà, A.
"Minnella bianca". **(White Minnella).**
Ann. Sper. agr. 1958 : **12** : No. **5** : Suppl. : xcvii–ciii.

The vine described, the origin of which is uncertain, is grown to a certain extent in the Catania province of Sicily, in association with other varieties exclusively for wine making.

1968 del Gaudio, S. & Nico, G.
"Primitivo".
Ann. Sper. agr. 1958 : **12** : No. **5** : Suppl. : cv–cxiii.

This black grape, the origin of which is uncertain, is valued for its aromatic qualities and its early maturity, to which it owes its name; it produces a wine of good quality used for blending and is much grown in the Taranto province of southern Italy.

1969 Maingonnat, A.
Les cépages musques. **(Muscat vines).**
Tunis. agric. 1958 : **59** : 89–96.

Descriptive notes on 11 muscat-grape varieties are presented.

1970 **New Cimarron grape.**
Amer. Nurserym. 1958 : **107** : p. 122.

Cimarron was selected at Oklahoma State University from a cross between Seneca and a wild Oklahoma grape. It is drought resistant and noteworthy for its evenness of ripening in dry Oklahoma summers. The berry is blue-black in colour and has a bloom; it is rather smaller than that of Concord. Also the tender juicy flesh is said to be much sweeter than that of Concord and of low acidity. At the Oklahoma Agricultural Experiment Station, near Perkins, Cimarron ripened two weeks before Concord in mid-August and outyielded mature vines of the latter. Cimarron is highly resistant to anthracnose; it is also more resistant to low temperatures than any of the four varieties currently recommended for Oklahoma. Cimarron is more vigorous than Fredonia and is easy to propagate.

1971 BRUNI, B.
Le uve apirene. (**Seedless grapes**).
G. Agric. 1958 : **68** : p. 413.

A short account is given of Italian and other varieties of seedless grapes of possible interest for Italian growers.

1972 FILIPPENKO, I. M.
(**Autumn injury to overwintering buds of the vine**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 7 : 30–32. [Russian].

Bujtur was the only variety among those tested showing no injury, while Lidija, Russkij Konkord [Russian Concord] and Nagrada [Reward] showed a fair resistance to low temperatures in the autumn.

FOREST TREES

1973 RUDEN, T.
Om mulighetene for øket råstoffproduksjon gjennom planteforedling. (**Possibilities for increased raw material production through plant breeding**).
Norsk Skogindustri 1957 : **11** : 298–301, 303–04, 306.

The work of the Norwegian Forestry Research Institute is outlined. It includes: the registration and vegetative propagation of rare and valuable trees; the establishment of (*a*) a clonal collection of local and introduced *Picea* species, chiefly *P. abies*, (*b*) three arboreta in which future hybridization is to be undertaken and (*c*) seed plantations of fir and larch; progeny testing of spruce, fir and birch; the study of methods of vegetative propagation; investigations on colchicine-induced polyploids and neutron-induced mutations in spruce; and crossing experiments with birch, fir and spruce.

1974 PERRY, T. O. & WANG, C.-W.
The value of genetically superior seed.
J. For. 1958 : **56** : 843–45.

Data are presented showing the probable increased profits obtainable from the use of seed with assumed degrees of genetic superiority of 0·5–50%. A further table shows the "justifiable waiting period in years to plant average seed in preference to planting inferior seed".

1975 HOFFMANN, K.
Die Aufnahme von Auslesebäumen als Grundlage für ihre genetische und physiologische Beurteilung. (**Records of selected trees as a basis for their genetical and physiological evaluation**).
Züchter 1958 : **28** : 257–62.

Forest trees are selected on the basis of their phenotypic characters, investigations being subsequently made to determine their genetic constitution and physiological characters. In such work, detailed records have to be kept of all the information gained concerning each selection. For this purpose a punched card file is recommended as being highly efficient; cards with marginal holes are used. Such a file is particularly useful in finding out quickly which of a large number of trees have a particular desired combination of characters.

1976 DUFFIELD, J. W. & SNYDER, E. B.
Benefits from hybridizing American forest tree species.
J. For. 1958 : **56** : 809–15.

A wide range of examples is discussed with reference to the occurrence of hybrid vigour, useful combinations of parental characters, long-term performance of hybrid progeny, choice of parents, utilization of hybrids and hybridization involving several species.

1977 GULISAŠVILI, V. Z.
(**Contradictory characteristics in the heredity of relict forest trees and their importance for the development of plant organisms**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1958 : No. **3** : 271–81. [Russian].

The plant species of the temperate fossil flora of the Cretaceous and Tertiary Epochs had all the characteristics of tropical plants. The climatic changes in the Pliocene and especially the Glacial Epoch resulted in the extinction of species with conservative heredity. Other species, heritably more plastic, underwent changes with the altered environment and have survived the effects of natural selection till the present day. However they still retain some heritable properties corresponding to the conditions of past epochs.

1978 WRIGHT, J. W., BINGHAM, R. T. & DORMAN, K. W.
Genetic variation within geographic ecotypes of forest trees and its role in tree improvement.
J. For. 1958 : **56** : 803–08.

After mentioning the extent of variability and the incidence of geographic clines in American forest trees the authors discuss the bearing of these factors on selection methods and the merits of ecotype selection *v.* single-tree selection under various conditions. Studies indicating possible intraecotypic genetic variation are critically reviewed and it is concluded that further extensive work in this field is required before maximum use can be made of the available variability.

1979 HUGUET DEL VILLAR, E.
Estudios sobre los *Quercus* del Oeste mediterráneo. (**Studies on the *Quercus* species of the western Mediterranean**).
An. Jard. bot. Madr. 1957 : **15** : 3–114.

In the introductory remarks to this posthumous taxonomic study of the Mediterranean oaks, the author explains his conception of the relative nature of the species and categories he has used; some forms have been given binomials for convenience of identification and reference; their relationships to other taxa are however indicated by grouping into complexes of various kinds; the same applies to hybrid populations if they have become permanently adapted to particular sets of ecological conditions. The identity of the chromosome number and morphology throughout the genus is taken as an indication that most of the specific differences have arisen by mutation and subsequent hybridization. Several species created by other authors are however regarded as varieties or lower categories; thus no grounds are seen for separating *Q. estremadurensis* from *Q. robur* or *Q. mas* from *Q. petraea*; *Q. palensis* is considered to be a form of *Q. lanuginosa* or possibly a hybrid, say of *Q. faginea* x *Q. lanuginosa*; *Q. cerrioides* is regarded as a form of *Q. lanuginosa*; and *Q. faginea* and *Q. lusitanica* to comprise a single species, *Q. muricata*, two groups of which are recognized. A large group occurring to the south of the Pyrenees and referred to as *Q. subpirenaica* is thought to be of hybrid origin, probably from *Q. lanuginosa* x *Q. muricata*; in the south-western portions of the peninsula similar groups of hybrids of *Q. muricata* with *Q. baetica* and *Q. mirbeckii* occur.

The work ends with an admonition to taxonomists to base their classification on a study not of herbarium specimens or isolated trees but of the living forest.

1980 RACK, K.
Untersuchungen über die Anfälligkeit verschiedener Eichenprovenienzen gegenüber dem Eichenmehltau. (**Investigations on the susceptibility of oaks of different provenances to mildew**).
Allg. Forst- u. Jagdztg 1957 : **128** : 150–56.

Among 29 German provenance types, tested in two different areas, resistance to *Microsphaera alphitoides* was found to depend chiefly on environment, but was also significantly, though to a small extent only, affected by (1) the occurrence of lammas shoots, (2) the species of oak, sessile oak showing less incidence than pedunculate oak, and (3) provenance.

1981 **Poplars in forestry and land use.**
FAO For. Stud. 1958 : No. 12 : Pp. 511.

This study was prepared at the request of FAO by the Standing Executive Committee of the International Poplar Commission. It includes a section on the classification, identification and distribution of poplar types and another dealing with genetics and breeding.

1982 BERGMAN, F. & LANTZ, A.
Ein Versuch zum Treiben von Kreuzungsreisern von Aspen (*Populus tremula* L.) bei niedriger Temperatur. [**An experiment on forcing at low temperatures of branches of aspen (*P. tremula* L.) for crossing purposes**].
Silv. genet. 1958 : **7** : 155–59.

When branches of aspen are being forced by water culture in the greenhouse, the branches sometimes dry out, the seed catkins falling off before they reach maturity. This drying out is due in part to microorganisms and their spores which collect on the submerged parts of the branches, enter the vascular system and block the channels so hindering the passage of water through the branches.

In experiments carried out at Sundmo in Sweden, the growth of the microorganisms was restricted by keeping the temperature of the water below + 5° C., this being effected by adding ice to the water three times a day. Under these conditions, a film of microorganisms did not form on the submerged parts of the branches and the branches remained fresh. Branches which had been so treated produced catkins which were significantly longer than those from normally treated control branches; also the 1000-seed weight was much greater after the cold treatment than after normal forcing. Seedlings resulting from the treated branches were significantly heavier and more vigorous than those from the control branches.

1983 **Hybrid poplars, pines show promise for Iowa.**
Iowa Fm. Sci. 1958 : **13** : p. 44.

Hybrid poplars and pines are being studied at Iowa State College Experiment Station. A hybrid poplar discovered in Lee County grows to a greater size and produces a greater volume of wood than white oak growing in the same locality. A hybrid pine from California appears to do well in Iowa.

1984 MEYER-UHLENRIED, K.H.
Untersuchungen über die Vererbung eines anatomischen Merkmals bei Kreuzungen von Pappeln verschiedener Sektionen. (**Investigations on the inheritance of an anatomical character in crosses of poplars of different sections**).
Züchter 1958 : **28** : 209–16.

Investigations were made at the University at Freiburg on varieties of poplar from the sections *Aigeiros* and *Tacamahaca* and some inter-sectional hybrids. Marked differences were noted between the two sections in respect of the average diameter of the EF vessels, these being the first vessels laid down in spring after the winter resting period. In making such comparisons it was necessary to measure vessels from exactly similar positions in each tree. The difference between the two sections seemed to be independent of locality. Varieties within each section did not differ significantly in this character. It was found that the diameter of EF vessels in the section *Tacamahaca* was dominant to the corresponding character in the *Aigeiros* section; a major gene appeared to control this character.
The two sections did not show any qualitative differences in the anatomy of their wood.

1985 JABLOKOV, A. S.
(**Question of phasic development of forest trees**).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. **3** : 110–20. [Russian].

Differences, said to be heritable, between some *Populus* forms and ecotypes with regard to their low-temperature requirements for passing through the vernalization phase are discussed.

1986 LEPAGE, E.
Deux Betula hybrides, nouveaux pour la Science. (**Two *Betula* hybrids, new to science**).
Ann. ACFAS 1957 : **23** : p. 96. (Abst.).

B. borealis x *B. pumila* var. *glandulifera* was found in Quebec and *B. populifolia* x *B. pumila* var. *glandulifera* in the counties of Saint-Jean and Missisquoi.

1987 ČIBIRAS, L., DŽIAUKŠTAS, P. & NEKRASOV, V.
(**An uncommon lime**).
Priroda (Nature), Leningrad 1958 : No. 9 : 111–12. [Russian].

A tree of *Tilia caucasica* found in Lithuania bears branches with laciniate, intermediate and entire leaves. The transmission of leaf characters to vegetative and sexual progenies is being studied.

1988 PRYOR, L. D. & BRYANT, L. H.
Inheritance of oil characters in *Eucalyptus*.
Aust. J. Sci. 1958 : **21** : p. 16. (Abst.).

Examination of segregates from *E. cinerea* x *E. macarthuri* and *E. pauciflora* x *E. robertsoni* or *E. dives*, and of F_1 hybrids between *E. maideni* x *E. rubida*, shows that recombination between oil yield and oil components on the one hand and morphological characters on the other occurs. Yield is sometimes principally determined by one parent. The variance of physical and chemical constants of oils derived from segregating hybrids is much greater than that of those for the parents. Oil constituents may be found in much greater quantity in some segregates than in either parent.

1989 SAITO, Y.
Artificial control of sex differentiation in Japanese red pine and black pine strobiles.
J. Fac. Agric. Tottori Univ. 1957 : **3** : 1–29.

Pinching off the shoot tips just before PMC meiosis caused transition to ♀ in lateral strobiles of *P. densiflora*. Transition to ♀ was fairly easily effected in *P. thunbergii* by pinching off combined with pollarding, sex being differentiated in this species about one month before PMC meiosis. Manuring with ammonium sulphate enhanced the effect of pinching off. Spraying with growth substances also brought about transition to ♀ in both species. The physiological conditions regarded as responsible for the inhibition of PMC meiosis and consequent sex transition are considered.

1990 Libby, W. F.
The back cross hybrid Jeffrey x (Jeffrey x Coulten) pine.
J. For. 1958 : **56** : 840–45.

The hybrid *Pinus jeffreyi* x (*P. jeffreyi* x *P. coulteri*) is highly resistant to the pine weevil, *Cylindrocopturus eatoni*, and is being extensively planted in regions of northern California where plantations of several *Pinus* species have been largely destroyed by the pest. It is less susceptible to cold than *P. coulteri*, has a higher percentage survival than *P. jeffreyi* even before weevil attack and its wood quality appears good. High weevil resistance is also shown by the complex hybrid [*P. jeffreyi* x (*P. jeffreyi* x *P. coulteri*)] x *P. ponderosa* but its other characteristics have not yet been fully evaluated.

1991 Schober, R.
Ergebnisse von Lärchen-Art- und Provenienzversuchen. (**The results of larch species and provenance trials**).
Silv. genet. 1958 : **7** : 137–54.

The results are compared of provenance trials of several larch species, these trials having been carried out in a number of European countries with trees of varying age. The Japanese larch *Larix leptolepis* gave the best results as regards growth in height in trials in north and central Europe; other types giving similar good results were those of European larch, *L. decidua*, from the Sudeten, Tatras, Poland and some eastern Alpine areas. Considerable variation in growth in height was noticed between the different European provenance types.

The Japanese larch showed high resistance to attack by *Dasyscypha willkommii* but hybrids between the Japanese and European larches were susceptible. *L. gmelini*, *L. gmelini* var. *olgensis* from Korea and European larches from Poland also showed low susceptibility to canker. The larch from the Sudeten area was almost free of attack in Würtemberg but suffered severely in Sweden and Denmark. Further trials are considered necessary for selecting the best Alpine and Japanese larches, importance being attached to the testing of identical provenance types in different localities.

1992 Boudru, M.
Races et écotypes chez le mélèze du Japon. (**Races and ecotypes in Japanese larch**).
Bull. Soc. roy. For. Belg. 1957 : **64** : 161–69.

Variation in natural populations of Japanese larch in Japan is described. Ecotypes from low altitudes generally have a poor trunk and a good crown and very poor specimens are rare. Ecotypes from high altitudes (1600–2000 m.) are characterized by straight trunks, variable crowns and the presence of abnormal individuals necessitating careful selection.

1993 Fuchs, M.
Les parasites mycologiques du sapin de Douglas *Pseudotsuga taxifolia* (LAM) Britt. (**Mycological parasites of Douglas fir, *Ps. taxifolia* (LAM) Britt.**).
Ann. Gembl. 1958 : **64** : 245–62.

In this survey, mention is made of published work on the resistance of *Ps. taxifolia* to *Rhabdocline pseudotsugae* and *Phaeocrytopus gauemanni*.

VEGETABLES

1994 Hahn, P. & Mildner, E.
Neue Gemüsesorten für den Anbau 1959. (**New vegetable varieties for cultivation in 1959**).
Dsch. Gartenbau 1958 : **5** : 205–07.

Varieties recently admitted to cultivation in the German Democratic Republic are described. Topas is an early cabbage of dark violet colour; it is considered to be an improvement on Frührot [Early Red] which showed great variability. Topas is medium large to large in size and the proportion of stalk produced is low; also noteworthy is the solidity of the mature heads. In yield Topas surpasses Früher Steinfester [Early Firm]; it also produces a high proportion of class A heads.

Schwarzer Peter [Black Peter] is a variety of *Scorzonera hispanica*. It resembles Einjährige Riesen [Annual Giant] which it surpasses in yield and in the proportion of class A roots produced. Schwarzer Peter also has a lower tendency to bolting and the cylindrical roots are suitable for mechanical harvesting. The root is deep brown in colour and the leaves are large and toothed.

Express is a new type of chicory for forcing; it surpasses the variety Witloof in yield and quality and produces an earlier harvest. The upright shoots are long, smooth and well-formed.

Nesthäkchen is a bush tomato similar in growth and yielding capacity to Sperls Zukunft [Sperl's Future]. The fruit is large, round or convex in shape and brick red in colour. This variety ripens early, in which respect it resembles the Jubiläum [Jubilee] type of tomato. Under unfavourable conditions of climate and soil, Nesthäkchen does not grow well; also the fruit has some tendency to crack.

Goldkind [Gold Child] is a French bean slightly later than Frühgold [Early Gold] but surpassing that variety in yielding capacity and the quality of its yellow pods.

Christensens Cornel is a medium-early marrowfat pea which has outyielded Diamant [Diamond]. The plants are medium high to high and the pods are dark green in colour and medium long to long in size, the seed being also of medium size.

Frühe Harzerin [Early pea from the Harz] is a high-yielding, early, shelling-pea variety which is similar to Onsa in respect of yield but the proportion of green seed produced is higher. This variety matures a few days before Onsa. The pods are medium to small in size and light to medium green in colour.

1995 MIL'ČIN, M. I.
(The latest results of varietal testing of tomatoes and cucumbers in the greenhouse).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 11 : 25–26. [Russian].

Cucumber. Mnogoplodnyj VSHV [Many-fruited Agricultural Exhibition] and Mnogoplodnyj iz Marfino [Many-fruited from Marfino] yielded more fruits, including first fruits, than Klinskij and all other varieties tested in 1957. Both varieties were selected from Klinskij.

Tomato. Among the varieties tested in the greenhouse in 1957, Altajskij Tepličnyj [Altaj Greenhouse], Eżednevnyj [Daily], Jabločnyj [Apple] and Leningradskij Skorospelyj [Leningrad Early] were distinguished by high yields, with a high proportion of top-grade fruits. Altajskij Tepličnyj has larger fruit than Bison and the other three varieties larger than Lučšij iz Vseh [Best of all].

1996 ODLAND, M. L., NOLL, C. J. & LYTLE, I. R.
1957 vegetable variety trials.
Progr. Rep. Pa. agric. Exp. Sta. 1958 : No. 189 : Pp. 8.

The results are reported of trials conducted by the Agricultural Experiment Station of Pennsylvania State University with varieties of beetroot, pepper, carrot, radish, onion, cabbage, broccoli, tomato, Lima and snap beans and sweet corn.

1997 KRYŽANOVSKIJ, F. D.
(Intergeneric grafts between members of the Solanaceae).
Priroda (Nature), Leningrad 1958 : No. 9 : 95–96. [Russian].

The F_0 plants from Simferopol' egg plant grafted on midseason or late tomato varieties at the Snigiri Experimental Farm produced large fruits under the conditions of Moscow province and the quality of the fruit was good. Some of the scions had smooth leaves, this acquired character being heritable. Varied degrees of sterility were observed among some F_0 graft hybrids, depending on the stock and scion varieties employed. Mention is also made of graft hybrids between *Cyphomandra* and potato, in particular *Cyphomandra*/Lorh potato. The F_0 plants bore fruits and tubers and lived for 1–2 years. The tubers were resistant to diseases, in particular *Streptomyces scabies* and ring rot.

1998 Neuheiten für die Branche. **(New varieties for the trade).**
Saatgutwirtschaft 1958 : **10** : 270–71.

Facta is a dwarf bean variety suitable for drying; it requires only a short cooking time and has a good taste. The seed is pure white and thin-skinned. Facta is nonshattering, early-ripening, high-yielding and resistant to diseases. Select is a sugar pea growing to a height of 180 cm. It is a late variety producing a high yield of large pods. Matus HKZ is an early-autumn variety of white cabbage suitable for use as a fresh vegetable and for making sauerkraut. The yield is high, the heads being large, firm and convex in shape. This variety is resistant to bursting and can be kept standing in the field for some time after it is ready for harvesting. Frühweiss Nostra HKZ [Early White Nostra HKZ] is another white cabbage; it is an improved type of Dithmarscher Früher [Dithmarsch Early]. The round firm heads, which do not burst, may be used for sauerkraut manufacture or as a fresh vegetable. Praeco is an early, nonbolting variety of Savoy cabbage; it is of high quality and suitable for an early field crop and for cultivation in small gardens.

1999 SGARAVATTI, N.
Il catalogo francese delle piante ortensi e da frutto. **(The French catalogue of vegetables and fruits).**
Sementi elette 1958 : **4** : No. 5 : 22–26.

Reference is made to the catalogue referred to at a meeting in Paris in 1955 [cf. XXVII, 805] and the desirability of similar measures in Italy is urged. An editorial note states that the first steps have in fact been taken to institute an official catalogue of varieties of tomato, potato, French bean, pea and cauliflower. Collections of cultivars of these plants are being grown in various localities and the first descriptions will, it is hoped, be published in 1959.

2000 NISHIYAMA, I.
Polyploidy studies in the Brassiceae, IV. Investigations on the cytology and fertility of autotriploid *Raphanus*.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 203–07.

Investigations were carried out on triploids of *R. sativus*, obtained as the result of crossing the commercial 4*x* variety Mino-Tetra as ♀ with the 2*x* variety Shogoin under conditions of open pollination. Configurations ranging from 9_{III} to $3_{III} + 6_{II} + 6_{I}$ were observed at metaphase I in the triploids, with $6_{III} + 3_{II} + 3_{I}$ as the mode. Univalents occurred in 25·7% of the PMCs. About half of the univalents lagging at anaphase I divided longitudinally, the halves of each going to opposite poles. Elimination of univalents at telophase II was about 15·4% of the theoretical total number of univalents. The triploids had 72·3% pollen fertility and 1·87 seeds per capsule, as against 98% and 3·05 for Shogoin.

2001 USTIMENKO, G. V.
(The results of studying varietal differences in the Jerusalem artichoke).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Akad.) 1958 : No. 5 : 103–16. [Russian].

The midseason variety Saratov and Vadim, characterized by late maturity and compact arrangement of the tubers, are mentioned for their high yield and especially for good over-wintering ability of the tubers in the ground under Moscow conditions. In this latter respect both varieties proved superior to Belaja Urožajnaja [White Productive] and Hybrid 120 [cf. XXVII, 2335].

2002 CAVIA, C. E. & GRNKO [CRNKO], J.
Tres nuevas variedades de cebolla tipo Valenciana. **(Three new onion varieties of the Valenciana type).**
Idia 1958 : No. 127 : 9–17.

Three synthetic varieties, Valenciana Sintética 1, 2 and 3, characterized by a low degree of premature flowering, a low proportion of thick-necked bulbs, firm, deep-coloured outer scales and good storage quality have been developed from material of Valenciana at La Consulta Substation, Mendoza, Argentina. The first variety has nearly spherical bulbs with rather thinner scales than the others, the second elongate bulbs and the third round bulbs with an exceptionally low proportion of double bulbs.

2003 PLINKA, A.
(New varieties of onion).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 11 : 26–27. [Russian].

Brief descriptions are given of two varieties from Gribovo producing marketable bulbs in a year. Danilov 301, with a yield of 150–250 c. per ha., was selected from a local variety from the province of Jaroslavl'; it has superior flavour to the South Russian semipungent varieties. Odnoletnij Gribovskij 702 [Gribovo Annual 702] was obtained by intercrossing different geographical strains of Zittau. It has a growth period of 110–115 days, yields 180–300 c. of high-grade bulbs per ha., keeps better than other semipungent varieties and shows improved resistance to *Botrytis*.

2004 NIKONENKO, D. A.
(The methods of culture and the varieties of onion in the south).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 9 : 18–20. [Russian].

Four standard varieties in the North Caucasus, Strigunovskij Mestnyj [Local Strigunov], Markovskij Mestnyj [Local Markovskij], Kabardinskij Rozovyj Mestnyj [Local Pink Kabarda] and Krasnodar G35, characterized by high yield, good keeping quality, earliness or drought resistance, are described.

2005 PERRY, B. A. & JONES, H. A.
Onion varieties in Texas.
Bull. Tex. agric. Exp. Sta. 1957 : No. 854 : Pp. 10.

Descriptions are provided of a series of open-pollinated varieties and F_1 hybrids; the results of some varietal trials held in Texas are also presented.

2006 JOSLYN, M. A. & PETERSON, R. G.
Reddening of white onion bulb purees.
J. Agric. Food Chem. 1958 : **6** : 754–65.

Marked differences were noted between varieties and between different bulbs of the same variety in respect of the tendency to form a red pigment in acidified purees made from the inner scales of the bulb; the formation of red pigment has also been noted during dehydration of onion tissue. White varieties tended to form the pigment more readily than yellow or red varieties; the formation of this pigment is considered to be an undesirable character. Data are presented on the isolation and characterization of the pigment.

2007 HANNA, G. C.
Four new asparagus varieties.
Calif. Agric. 1958 : **12** : No. 10 : p. 13.

Preliminary results suggest that 309, 500W, 711 and 873 may represent improvements in yield and other characters over the standard variety 500 in California.

2008 Stammeforsøg med holdbar vinterhvidkål 1954–57. (**Strain trial of winter cabbage for keeping, 1954-57**).
Tidsskr. Planteavl 1958 : **62** : 541–44.

Details of the yield and quality of 11 winter cabbages grown at four stations in Denmark are given. Four strains of Amager Høj [Amager Tall] and one each of Amager Vinter [Amager Winter] and Amager Stenhoved [Amager Stonehead] are recommended.

2009 HU, C.-C. & HUANG, H.
(**Measurements of some characteristics of cabbage varieties**).
Tai-wan Ta-hsueh Nung-hsueh-yuan Yen-chiu Pao-kao/Mem. Coll. Agric. Taiwan Univ. 1957 : **5** : 52–64. [Chinese].

Quantitative descriptions are given of the characteristics of the head of some introduced, mainly American, varieties and of some locally developed forms.

2010 FEDULOVA, A. P.
(**Methods of breeding white-headed cabbage for earliness and the nonbolting habit**).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. **3** : 131–35. [Russian].

An account of selection of Nomer Pervyj Poljarnyj K206 [Arctic Number One K206] and Zolotoj Gektar 1432 [Golden Hectare 1432] at Leningrad and Hibiny is given. First, using morphological characteristics as an indication of earliness, early, midseason and late forms were selected from each variety. Then the seed progenies were tested for the incidence of bolters. The results include a few productive and early nonbolting families.

2011 NIEUWHOF, M.
Ervaringen op het I.V.T. met de veredeling van spitskool. III. IV. V. Slot. (**Experiences in breeding pointed-headed cabbage at the Institute of Horticultural Plant Breeding. III. IV. V. Conclusion**).
Zaadbelangen 1958 : **12** : 204–05, 218–19, 236–38, 250–51.

In part III of this series [cf. XXVIII, 4806] the slowness and inefficiency of mass selection as a breeding method are pointed out and examples of the quicker, more effective family selection method are given. In each of two strains of Eersteling, plants selected for earliness were crossed in pairs and the parents giving the earliest F_1 plants were vegetatively maintained for the continued production of the hybrids. The earlier of the two original strains gave F_1 progenies showing markedly less variation in earliness than those of the other strain. In part IV it is reported that the F_2 and F_3 of the selected crosses differed little from the F_1 in earliness or productivity and that selection for these characters in the F_1 had little effect, indicating that the parents used were genetically closely related. Where this is the case, multiplication by seed propagation from the F_1 for one or two generations may be employed to give commercial seed almost equal to that of the F_1 in uniformity. An example of response to selection in the F_1 of crosses in which the parents are less alike is also given. Part V outlines the isolation, crossing and testing procedures involved, showing that a minimum of four years is required for the production of the F_1 seed. The final article describes the characters required in commercial pointed-headed cabbages in the Netherlands and explains why many selections fail to be approved in the official trials [cf. XXVIII, 3469]. The difficulty of combining earliness with productivity is noted.

2012 NYHLÉN, Å.
Lagring av vitkål. Försök vid Rastaborg och Nyckelby 1946–55. (**Storage of cabbage. Trials at Rastaborg and Nyckelby, 1946-55**).
Medd. Trädgårdsförs. 1958 : No. **111** : Pp. 23.

In these Swedish trials, storage losses among nine varieties and strains increased markedly above temperatures of 0–5° C. The greatest interstrain and intervarietal differences were in percentages of cracked heads.

2013 THOMPSON, K. F.
Breeding better kales.
Agriculture, Lond. 1959 : **65** : 487–91.

Work at the Plant Breeding Institute, Cambridge, England, is outlined. Production of double-cross seed from inbred lines is receiving attention, with the aid of the information now obtained on the self-incompatibility system [cf. XXVII, 3516]. A leafy, short-stemmed variety of marrow-stem not growing taller than 3 ft. when sown in April would probably be valuable for strip grazing. Breeding such a type has been in progress for six years, the double-cross method having been used to ensure uniformity of height. Without loss in leaf production, selection has also been made for thicker stems to compensate for the lower-yielding short stems, and stems with less wood near their bases. Trials at Cambridge have suggested that the short-stemmed type will give only 90% of the total yield of a taller commercial stock, but it is thought that farmers will be prepared to sacrifice yield for grazing with less wastage and labour. Marrow-stem lines with better winter hardiness have also been selected, a few possessing stems which are not very woody. Work has been initiated to develop an improved variety of marrow-stem with a height of about 4½ ft., suitable for mechanical cutting and feeding to cattle in the stockyard. Improvement of thousand-head kale is confined to producing a uniform stock of a leafy, short-stemmed type which branches freely from ground level and is winter hardy and late flowering. Such a variety would be useful for grazing in March and April. Although it is unlikely that a marrow-stem equal to thousand-head kale in hardiness can be bred in the near future, the best long-term method for improving late winter grazing may be based on the transference of desirable characteristics from thousand-head and other hardy kales to marrow-stem.

2014 DU CREHU, G.
Le chou fourrager. Étude biologique. Problèmes variétaux. (**Kale. A biological study. Varietal problems**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1957 : **7** : 313–36.

Information is provided on the growth and reproduction of kale, methods of cultivation being also discussed. All cultivated varieties are thought to have originated from three basic types, *moëllier*, *branchu* and *cavalier*, corresponding to the marrow-stem and branched kales and the tree cabbages respectively. These three types differ markedly in their morphological and physiological characters. A simple classification for some of the principal kinds of kale is presented, together with information on the foliage production of some kales tested at Rennes.

The *moëllier* kales were found to be the earliest, whereas the *cavalier* types grew slowly; also the former were more susceptible to frost. Caulet des Flandres is almost completely resistant to frost. Damage by frost depends on the size and tenderness of the leaves and on the proportion of vein and petiole, the veins and petioles being particularly susceptible. In general the most productive varieties are the least hardy. The marrow-stem types produce more forage and more nitrogenous matter per ha. than the other types of kale, although the contents of dry and nitrogenous matter are lowest in plants of the most productive kales.

2015 JOHNSON, A. G.
Male sterility in *Brassica*.
Nature, Lond. 1958 : **182** : p. 1523.

Male-sterile plants have been found in inbred material of three varieties of Brussels sprouts at the National Vegetable Research Station, Wellesbourne, Warwick, England. In one of these varieties, one male-sterile plant was also discovered in the 5000 noninbred plants examined. Meiotic division proceeded normally but in the majority of anthers pollen development ceased at the tetrad stage. In about 1% of the anthers, about 10% of the tetrads continued to develop into apparently normal grains, but no seeds were obtained when this pollen was applied to stigmas of normal plants. The male sterility depended on a single recessive gene. The expression of dominance of male fertility was however incomplete, about 25% of the heterozygotes producing up to six male-sterile flowers, usually at the base of the inflorescence. Some evidence was obtained that the expression of dominance was affected by temperature, since heterozygotes kept at 70° F. produced more male-sterile flowers than others kept at about 55° F. Male sterility is expected to be of use in the production of hybrid seed. [Cf. XXVIII, 4770].

2016 LINDQVIST, K.
Inheritance of lobed leaf form in *Lactuca*.
Hereditas, Lund 1958 : **44** : 347–77.

Data from crosses involving *L. serriola* ff. *typica* and *integrifolia*, *L. altaica* and *L. sativa* indicated that the oak-leaved, lobed and nonlobed types are each determined by a member of a multiple allelic series, respectively designated U_{oak}, U_{lob} and *u*. The term oak-leaved refers to the type of lobing found in some varieties of *L. sativa* while "lobed" is used for the type occurring in *L. altaica* and *L. serriola* f. *typica*. Segregation for leaf form frequently departed from the monohybrid ratio, an excess or deficiency of the oak-leaved type and a deficiency but never an excess of the lobed type being obtained. A recessive gene (*V*) discovered in a line of *L. serriola* f. *typica* and having the effect of gradually reducing anthocyanin pigmentation as the plant developed was completely or very closely linked with locus *U*. By means of this linkage it was proved that Durst's hypothesis of complementary genes for leaf lobing is untenable. It is suggested that genetically controlled abnormalities at gametogenesis or fertilization are responsible for the discrepancies in segregation ratios.

2017 PEETERS, L.
Selectie en veredeling in de Witloofteelt. (**Selection and breeding in the culture of Witloof chicory**).
Tuinbouwber., Leuven 1958 : **22** : 237–40, 256.

The methods of positive mass selection, family selection, inbreeding and clonal selection are outlined for the benefit of Belgian growers. Inbreeding for two generations results in high uniformity and no apparent inbreeding depression but gives low seed yields. Results of crosses with endive are reported to be unsatisfactory.

2018 FILIPESCU, H.
Estimarea rapidă a conţinutului de inulină în rădăcinile de cicoare. (**Rapid estimation of the inulin content of chicory roots**).
Bul. şti. : Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 427–35.

A refractometric method suitable for use in breeding for inulin content is described.

2019 (**The melon Koj-Baš**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **11** : p. 26. [Russian].

Koj-Baš is a late high-yielding Uzbek variety, of good keeping quality and transportability. The fruit is large with thick sweet white flesh of crunchy consistency.

2020 KONONKOV, P. F. & PETROVA, L. L.
(**The melon variety 121/49, obtained by means of vegetative hybridization**).
Agrobiologija (Agrobiology) 1958 : No. **3** : 146–49. [Russian].

Graft hybridization of Krymka Odesskaja [Odessa Crimean]/the Uzbek variety Kzyl-Uruk at Odessa is described. The resultant hybrid outyielded all other varieties tested at Odessa, including the standard Doč' Kolhoznicy [Collective Farmer's Daughter], and was at the same time distinguished by fine flavour. Similar results were obtained with the new variety in Ukrainian and Moldavian trials, where 121/49 yielded the most fruit. Mention is made of a sexual hybrid of Krymka Odesskaja x Kzyl-Uruk also bred at Odessa. It has similar properties to the vegetative hybrid 121/49 but needs further improvement, especially with regard to morphological uniformity and quality of the fruit.

2021 (**The water melon variety Birjučij Kut 775**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **11** : p. 26. [Russian].

The variety described was obtained by single plant selection among hybrids of Korol' Kuby [Cuban King] x Korean and is characterized by midseason maturation, productiveness and drought resistance. Its transportability, keeping quality, flavour and resistance to *Fusarium* are referred to as average.

2022 USATJUK, M. K.
(**The storage and preserving of water melons**).
Sad i Ogorod (Gn. & Veg. Gdn.) 1958 : No. **9** : 35–37. [Russian].

Mention is made of Čit, Melitopol' 143 and some other varieties which keep well for over two months. They all have smallish fruit with a hard rind.

2023 ŽUKOVSKIJ, P. M.
(**A triploid water melon**).
Bjull. Vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1958 : No. **4** : 51–53. [Russian].

Instructions for the production of seedless triploid water melons, by crossing diploids with colchicine-induced tetraploids are given, apparently based on Japanese research [cf. XXII, 3045].

2024 GREBENŠČIKOV, I.
Über zwei *Cucurbita*- Artkreuzungen. (**Two *Cucurbita* specific crosses**).
Züchter 1958 : **28** : 233–37.

The new cross *C. moschata* x *C. foetidissima* has been effected at Gatersleben. As seed parent, the variety Melk 11 was used; the pollen parent came from Chillicothe, Texas. These two species are markedly different in morphological characters. After pollination, fruits of normal appearance developed on Melk 11 but only about 100 seeds developed in each fruit, whereas after selfing the number is near 400. Two F_1 plants were studied; in their morphological characters and habit, they closely resembled *C. foetidissima* but they were intermediate to the parents as regards the form of the flowers and fruits. All male flower buds died before opening. Fruits were obtained after pollination of the female flowers by either parent or by another variety of *C. moschata*. The seeds in all the twelve fruits obtained were poorly developed and no F_2 generation was bred.

In addition, the cross *C. moschata* 'Cushaw Squash' x *C. foetidissima* was attempted; fruits developed on the mother plant but no viable seed was obtained. The F_1 hybrid, *C. moschata* x *C. maxima* "Sweetmeat" was also pollinated by *C. foetidissima* and one F_1 plant resembling the seed parent was obtained; this hybrid was sterile. Other crosses involving *C. foetidissima* were completely unsuccessful but only small numbers of plants were involved in these experiments. Whitaker's suggestion that *C. lundelliana* may be the ancestor of the cultivated species of *Cucurbita* is criticized [cf. XXVII, 928]. Further investigation of little-known wild species may reveal that these are like *C. lundelliana* in being cross compatible with the cultivated species.

A successful cross was made between *C. mixta* and *C. pepo* var. *oleifera* 'Tschermak-Ölkürbis' [Tschermak oil pumpkin]. The F_1 plants were relatively uniform and resembled *C. pepo*; three selfings were effected without difficulty in the greenhouse. An F_2 generation raised in the open showed decreased vigour as compared with the F_1 and many of the male flowers were sterile. These hybrids were variable in form. The ratio of nongreen to green fruits in the F_2 was 85 : 31; also the ratio of bitter : nonbitter fruits was 92 : 24. These segregations are thought to be indicative of a certain homology of loci in *C. pepo* and *C. mixta*. Some of the F_2 progeny had seeds with the thin testa of the *C. pepo* parent, which suggests that *C. pepo* is more closely related to *C. mixta* than to *C. maxima*. Other interspecific crosses were also attempted; it was found that *C. mixta* crosses most easily with *C. pepo* and *C. moschata*. None of the crosses studied are of direct practical importance.

2025 Schloms, M.
Embryologische Untersuchung zur Frage der unterschiedlichen Entwicklung reziproker Bastardembryonen aus Kreuzungen zwischen Riesenkürbis (*Cucurbita maxima* Duch.) und Gartenkürbis (*Cucurbita pepo* L.). (**Embryological investigation on the question of the differential development of reciprocal hybrid embryos from crosses between *C. maxima* and *C. pepo***).
Forschung und Beratung 1958 : No. 6 : 301–03.

It was found that embryos from the cross *C. pepo* x *C. maxima* were greatly inhibited in their development, degeneration of the endosperm occurring. In the reciprocal cross, no degeneration was observed during 30 days of development but the embryos grew less quickly than those of either species after normal pollination. Differences were also noted in the effect of dyes on the embryos of the two species and of the hybrids.

2026 Weiling, F.
Über das Auftreten und die Bedeutung diploider Pflanzen mit Gigaspollen. (**On the occurrence and significance of diploid plants with gigas pollen**).
Flora, Jena 1958 : **146** : 340–53.

Amongst 1500 plants of *Cucurbita maxima*, two plants with unusually large pollen were found, the number of germ pores being also increased. In one case, where the plant was a normal diploid, it is thought that a gene mutation was responsible for the increased pollen size. The other plant was aneuploid with $2n = 42$ or 43, the female parent having received colchicine treatment; this treatment may have been responsible for the production of giant pollen in the second plant.

It is pointed out that counting the number of germ pores on pollen grains is not an infallible method of distinguishing artificial polyploids.

2027 Kalajdžiev, I.
(**Forage pumpkins**).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1958 : No. 3 : 26–27. [Bulgarian].

Mention is made of new varieties of *Cucurbita moschata* highly productive of carotene bred at the Marica Institute. However they yield appreciably less fruit, dry matter and crude protein per unit area than the *C. maxima* variety Marica.

2028 Weiling, F. & Schagen, R.
Über die Ursachen des Auftretens tauber Samen bei Ölkürbis (*Cucurbita pepo* L.). [**On the causes of the occurrence of hollow seed in the oil pumpkin (*C. pepo* L.)**].
Forschung und Beratung 1958 : No. 6 : 303–04.

The substance of this paper has been summarized from another source [XXVIII, 4826].

2029 Hohlačeva, N. A.
(**The cucumber variety Jubilejnyj 46**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : p. 73. [Russian].

Jubilejnyj 46 [Jubilee 46] (Astrahan' x Zelenyj Urožajnyj [Green Productive]) was bred at Krasnodar. It is more productive of fruit, especially first fruits, than the midseason standard Nežinsk. The first fruits ripen uniformly, 4–5 days earlier than those of the standard.

2030 MEHANIK, F. JA.
(The effect of acetylene upon the development of female flowers in cucumbers).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : 13–15. [Russian].

Plants of the variety Vjaznikovskij grown under cellophane bags containing acetylene bore more ♀ and fewer ♂ flowers, produced more and larger fruits and ripened 4–6 days earlier than untreated controls at Gorki, Mogilev province.

2031 MEEUSE, A. D. J.
The possible origin of *Cucumis anguria* L.
Blumea 1958 : Jubilee Vol. : Suppl. 4 : 196–205.

The only constant differences between the fruits of the West India gherkin, *C. anguria*, and those of the wild African species *C. longipes* are that the former are more oblong in shape and have sparser and shorter soft spines and that the latter are bitter. The young plants are similar in growth habit and strains of both species grown in Pretoria were highly resistant to fungal diseases and trypetid flies. In addition, the species cross readily to give fertile hybrids. For these reasons it is concluded that *C. anguria* is a cultigen of *C. longipes* and was probably introduced to the New World about 300 years ago through the slave trade from West Africa. The F_1 hybrids were intermediate in morphology and segregated for leaf shape and spine development in the F_2. Bitterness was dominant and monogenically determined.

2032 UNCINI, L.
Il contributo del Centro Appenninico alla sperimentazione collegiale sul pomodoro anno 1956. **(The contribution of the Apennine Centre to collective experimentation on the tomato, 1956).**
Genet. agr. 1957 : **8** : 10–33.

Field trials of 9 varieties suitable for puree and 6 for peeling are described. Data are provided on yield, vegetative period and germinability, and, in the case of the puree varieties, content of dry matter, sugar and acids is also recorded.

2033 LESLEY, J. W., LESLEY, M. M. & TURRELL, F. M.
Cytogenetic and pigment studies of a blue-green mutant from P^{32}-treated seeds of the tomato.
Amer. J. Bot. 1958 : **45** : 598–602.

A bluish-green mutant of Canary Export induced by absorption of *β* particles behaved as though dependent on a single recessive gene. Under field conditions it produced leaves containing higher concentrations of chlorophylls a and b than normal green plants of the parental variety and redder fruits when grown in the greenhouse. Compared with the normal type, the mutant showed reduction in size of the plant, leaves and fruits, although relative to plant size producing nearly as many fruits. Cytological evidence suggested that it was homozygous for an inversion. The characteristics of the mutant may be due to either a very small deficiency or a position effect.

2034 MAKSAKOVA, V. M.
(The formation of biological properties in tomatoes under varied growing conditions).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1958 : No. **3** : 136–40. [Russian].

Experiments on training tomato hybrids for increased yield and improved earliness, hardiness and fruit quality at the Vegetable Institute, Moscow province, are described. The hybrids were obtained by fertilizing early hardy varieties such as Štambovyj Karlik 01185 [Determinate Dwarf 01185] by the pollen of Alisa 639 or other late nonhardy types, the parental forms having been grown on different soils previous to crossing.

The training of the F_1 consisted of hardening young plants by subjecting them to alternating temperatures and by giving increased doses of (1) P and K or (2) N fertilizer. The best results were observed in the F_2 plants from treatment (1).

2035 ALEKSANDROV, S. V.
(The tomato variety Ural'skij Mnogoplodnyj 281).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 10 : p. 26. [Russian].

Ural'skij Mnogoplodnyj 281 [Ural Many-fruited 281] was obtained by intravarietal hybridization and directed training of a selection of Regina Webb at the Institute of Plant Industry. It is an early variety for culturing under glass with a 30–40% higher yield than Bison. The fruit has good consistency and flavour.

2036 TOMES, M. L., QUACKENBUSH, F. W. & KARGL, T. E.
Synthesis of *β*-carotene in the tomato fruit.
Bot. Gaz. 1958 : **119** : 250–53.

"1. Two tomato crosses were examined. By use of the pigment mutant apricot (*at at*) which inhibits the production of lycopene in the fruit of the tomato but does not inhibit the "normal" production of β-carotene, it was shown that the action of the gene B in producing more than normal quantities of β-carotene is dependent upon a system which would otherwise produce lycopene in quantity. Support for this view is derived from a cross in which the quantity of lycopene was enhanced genetically, resulting in an appropriate increase in β-carotene in B-carrying strains.

"2. These results support earlier investigations with regard to the action of B and enhance an earlier suggestion that, in the fruit of the tomato, β-carotene may be derived by two separate paths." [Authors' summary].

2037 Lee, A. E.

The effects of various treatments in different genetic lines of excised tomato roots grown in culture.

Bull. Torrey bot. Cl. 1958 : **85** : 335–40.

Three lines showed differences in response in relation to (1) the initial length of the excised root tips, (2) sucrose concentration in the medium and (3) addition of indole-3-acetic acid.

2038 Fortney, W. R.

Genetic and anatomical studies of imperfect stylar scar formation in tomatoes.

Diss. Abstr. 1958 : **18** : LC Card Mic 58–1775 : p. 1930. (Abst.).

In studies of an abnormality in which the stylar abscission layer was formed either very close to the locule or across the top of an upward extension of the locule, resulting in the formation of a hole in the stylar scar, highly significant positive correlations were found between fruit shape, scar size, number of scar openings, presence of channels, presence of rot and number of locules. The correlations were highest between number of openings on the one hand and presence of channels, scar size and presence of rot on the other. Intervarietal differences in presence of channels were highly significant. Data from crosses between lines with high and low incidence of scar openings indicated that the character is quantitatively inherited. There was some evidence that selection for reduced number of openings may be effective.

2039 Sawant, A. C.

Cytogenetics of interspecific hybrids, *Lycopersicon esculentum* Mill. x *L. hirsutum* Humb. and Bonpl.

Genetics 1958 : **43** : 502–14.

In studies carried out at the University of California, three lines of *L. esculentum* were used: line a derived from San Marzano with the marker genes woolly (wo), dwarf (d) and male sterile$_{10}$ (ms_{10}), linked on chromosome 2; line b, also derived from San Marzano, and carrying the marker genes anthocyaninless (a), potato leaf (c), lutescent (l) and male-sterile$_{10}$ (ms_{10}); and line c, the variety Pearson, with the self-pruning (sp) and male-sterile$_2$ (ms_2) markers. These stocks were used as the female parents in crosses with two forms of *L. hirsutum*, a typical form from Rio Chillon, Peru, and a collection of *L. hirsutum* f. *glabratum* from Baños, Ecuador. The forms are referred to as Chillon and Baños respectively. Chillon is more hairy than Baños and the two forms also differ in other morphological characters. Chillon is sensitive to day length and self incompatible whereas Baños like *L. esculentum* is insensitive to day length and self compatible. In effecting the crosses, pedicels and calyces were treated with indolebutyric acid to induce fruit set; all untreated crosses failed. After treatment, fruit set in field crosses was 6·3–14% in *L. esculentum* x Chillon. Pollen of *L. hirsutum* was most successful in setting fruit on line c. A statistical test of heterogeneity showed that the difference between line c and lines a and b in receptivity to Baños pollen was highly significant; when Chillon pollen was used the difference was not significant. It is also stated that the difference in receptivity of the same lines of *L. esculentum* to pollen of the two *L. hirsutum* forms was significant. Under greenhouse conditions of 70° F. during the day and 60° F. at night, the fruit set was 76·6%, there being no significant difference between interspecific and intraspecific crosses. Most of the fruits from interspecific crosses contained seeds with aborted embryos. *L. esculentum* x Baños had 4 to 20 and *L. esculentum* x Chillon had 4 to 11 seeds per fruit, whereas Baños after selfing has 50·4 ± 2·5 seeds per fruit and in the *L. esculentum* lines the number is 100 or more. The crosses involving line c had the highest number of seeds per fruit and also when Baños was the pollen parent the seed set tended to be higher than in crosses of Chillon. Even under greenhouse conditions the interspecific crosses had significantly lower seed set than either parent.

It was found that in progenies segregating for a and c, the class ac was larger and the class $+c$ smaller than is expected on the basis of independent segregation, these deviations being greatest in crosses with Chillon as the pollen parent. Also in the segregation of sp and ms_2, the class $sp+$ was larger and class $+ms_2$ smaller than expected, the deviations being greatest in crosses involving Baños. Linkage reduced the frequency of the recombination types *Wo+* and *+d*. The cross-over value between *Wo* and *d* in the F_1 of *L. esculentum* x Chillon was lower than that of *L. esculentum* x Baños. It is thought that this may be explained by a reduction in chiasma frequency, the mean chiasma frequencies for the second chromosome being lower in F_1 *L. esculentum* x Chillon than in *L. esculentum* or F_1 *L. esculentum* x Baños. Also the mean chiasma frequency for the full complement of chromosomes was lower in the F_1 hybrid of Chillon than in the parental forms or the F_1 hybrid of Baños. Pollen abortion was also greatest in F_1 *L. esculentum* x Chillon, possibly caused by interaction between complementary genes from the two species.

These genetical and cytological findings are thought to confirm the separation of *L. esculentum* and *L. hirsutum* into distinct species and to indicate that *L. esculentum* is more closely related to Baños than to Chillon, this latter view being supported by physiological and morphological comparisons.

2040 STAPP, C. & HARTWICH, W.
Zur Frage der Resistenzverschiedenheiten pflanzlicher Wirte gegenüber pathogenen Bakterien und ihre Ursachen. II. Mitt.: Weitere Untersuchungen mit *Erwinia phytophthora*. (**On the question of differences in resistance among plant hosts towards pathogenic bacteria and their causes. II. Further investigations on *E. phytophthora***).
Zbl. Bakt. 1956 : Abt. II : **109** : 611–27.

Among 49 Solanaceous species, seven proved highly resistant, 12 were resistant and the remainder showed varying degrees of susceptibility. In the susceptible plants *Nicotiana quadrivalvis* and *Lycopersicon esculentum* 'Haubners Vollendung', the increase in growth of the parasite with increasing temperature, in the range 4–26° C., was similar to that *in vitro*, but in the resistant species *Cyphomandra betacea*, pathogen growth at 26° C. ceased after five days. When infected, the susceptible species *N. quadrivalvis* entirely lost its ability to form wound cork, while in the less susceptible species *L. esculentum* and the resistant *C. betacea* wound-cork production after infection was stimulated for progressively shorter periods with increasing temperatures. Investigations on other species show that the association between resistance and stimulation of wound-cork production was not close.

2041 STAPP, C. & HARTWICH, W.
Zur Frage der Resistenzverschiedenheiten pflanzlicher Wirte gegenüber pathogenen Bakterien und ihre Ursachen. III. Mitt.: Faktoren von Virulenzeinfluss auf *Erwinia phytophthora*. (**On the question of differences in resistance among plant hosts towards pathogenic bacteria and their causes. III. Factors affecting virulence in *E. phytophthora***).
Zbl. Bakt. 1957 : Abt. II : **110** : 449–70.

Studies of a number of Solanaceous species have shown that resistance increases with increasing pectin content of the plant, is inversely proportional to Ca content of the plant and decreases as the ratio Ca : pectin increases. Treatment with Ca solutions generally resulted in an increase in resistance, the highest degree of resistance occurring in those plants treated with highest concentrations. Host plants with a high water content were more susceptible than those with a low. Susceptible species grafted on to the resistant *Cyphomandra betacea* became more resistant, but remained unchanged when used as stocks for *C. betacea* scions. The respective reactions of *C. betacea* and *Lycopersicon esculentum* were the same after treatment with a pectinase preparation as after inoculation with *E. phytophthora*. In addition to increasing resistance, Ca had the opposite effect of increasing the activity of pectinase solutions, an effect also shown by other ions in the order K > Na > Mg > Ca. Under the experimental conditions used, resistance was greater the greater the number of nodes per unit length of the host plant, irrespective of species.

2042 STALL, R. E.
An investigation of nuclear number in *Alternaria solani*.
Amer. J. Bot. 1958 : **45** : 657–59.

The above investigation was carried out to gain information relevant to the mode of variation in pathogenicity, with a view to facilitating tomato breeding for resistance. The reproductive and vegetative cells were predominantly multinucleate. The cytological and morphological evidence indicated that heterocaryosis could occur.

2043 MCDONNELL, K.
Absence of pectolytic enzymes in a pathogenic strain of *Fusarium oxysporum* f. *lycopersici*.
Nature, Lond. 1958 : **182** : 1025–26.

An ultraviolet-induced mutant, strain 80, which produces no pectolytic enzyme, but produces pectin methyl esterase, was moderately pathogenic on the susceptible tomato Kondine Red, although it failed to cause the severe symptoms found in plants inoculated with the wild-type strain R–5–6. Unless strain 80 has a requirement for a specific substance for pectolytic enzyme synthesis which is available to some extent in the host tissues, it can be concluded that the enzyme is not necessary for the establishment of the pathogen in the host or for the production of symptoms in moderately diseased plants.

2044 Termohlen, G. P.
Kurkwortelverschijnselen van tomaat, veroorzaakt door een steriel mycelium. II. (**Corky root symptoms of tomato caused by a sterile mycelium. II**). Tijdschr. PlZiekt. 1957 : **63** : 369–74; and Meded. Inst. PlZiekt. Onderz. 1957 : No. 162.

Among isolates of the sterile mycelium causing corky root in tomato, ten strains differing in growth rate, colour and pathogenicity were distinguished.

2045 Gilbert, J. C.
The inheritance of resistance to severe root knot from *Meloidogyne incognita* in tomato.
Proc. Hawaii. Acad. Sci. 1956 : **31** : p. 17. (Abst.).

Resistance in material derived from a cross between *Lycopersicon esculentum* and the resistant species *L. peruvianum* appears to be dominant and controlled by a single gene *Mi*. There was evidence of linkage between undesirable characters and resistance but several early, resistant lines fairly free from cracking have been selected. The gene *Mi* lies in linkage group IV, having a recombination value of about 40% with the potato-leaf gene *c*.

2046 Ghisleni, P. L. & Quagliotti, L.
Esperienza su l'attitudine di alcune cultivar di melanzana (*Solanum melongena* L.) a fornire frutti di differenti classi ponderali. [**Notes on the tendency of certain cultivars of egg plant (*S. melongena* L.) to produce fruits of different weight classes**].
Allionia, Torino 1957 : **3** : 17–21.

Clear differences were established in the four cultivars studied in respect of total weight of fruit per plant; one of the three, Lunga violetta di Barbantane [Barbantane Long Violet], consistently bore smaller fruits than the other three, having a smaller proportion of fruits in the weight class 100–300 g., which is the class most desired for the market. It is thought that improvement might be effected by means of selection.

2047 Picard, J. & Berthelem, P.
La féverole. (**The field broad bean**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 287–311.

The results are presented of studies carried out at Versailles, Rennes and Dijon on the use of *Vicia faba* var. *minor* and var. *equina* for seed and forage production. The yield of seed from spring varieties was found to depend on the size of the seed; Strube, a German variety, gave the highest yields. The yield of seed from winter varieties is considered to be unsatisfactory. The varieties did not differ greatly in yield of green forage or in the dry-matter, crude protein or soluble-carbohydrate content of the forage.

2048 Gottschalk, W.
Über die genetischen Verhältnisse einer Komplex-Mutante von *Vicia faba*. (**On the genetic relations of a complex mutant of *V. faba***).
Angew. Bot. 1958 : **32** : 147–52.

Crosses between normal plants and a mutant form in which the early leaves are simple and the flowers show various abnormalities together with a high degree of sterility indicated that the mutant characters were recessive and determined by a single pleiotropic gene.

2049 Michaelis, A. & Rieger, R.
Cytologische und stoffwechselphysiologische Untersuchungen am aktiven Meristem der Wurzelspitze von *Vicia faba* L. II. Mitteilung. Präferentielle Verteilung der chromosomalen Bruch- und Reunionspunkte nach anaerober Quellung der Samen. (**Investigations of cytology and metabolic physiology in the active meristem of the root tip of *V. faba* L. II. Preferential distribution of the chromosomal break and reunion points after anaerobic soaking of the seed**).
Chromosoma 1958 : **9** : 514–36.

Automutagenic substances resulting in chromatid and isolocus breaks and chromatid reunions were produced in seeds of *V. faba* kept under anaerobic conditions [cf. 853]. Breaks and reunions were most frequent in heterochromatic regions of the chromosomes; thus in each m chromosome, breaks and reunions were most frequent in the central region of the long arm and the proximal region, whereas in the SAT chromosomes the breaks were mostly found at the centromere or neighbouring regions and at the secondary constriction. Breaks in the SAT chromosomes were less frequent than expected considering the length of this chromosome; also free breaks were far more frequent than those involved in translocations. Interchanges between homologous and nonhomologous chromosomes occurred more or less at random except that interchanges between two SAT chromosomes were more frequent than interchanges between SAT and m chromosomes.

Asymmetrical chromatid translocations were found to be slightly more frequent than symmetrical translocations; sister chromatid reunions were of about equal frequency in centric and acentric fragments. Interchanges were considerably less frequent than exchanges between chromosomes.

2050 CARDONA A., C., BARROS N., O. & SKILES, R. L.
Diacol Nutibara, una nueva variedad de fríjol. (**Diacol Nutibara, a new French bean variety**).
Bol. Divulg. DIA, Bogotá 1958 : No. 4: Pp. 15.

The above high-yielding variety, developed at the Tulio Ospina Agricultural Experimental Station, Medellín, Colombia, has an erect well-branched habit, producing its numerous pods close to the main stem and thus diminishing the likelihood of lodging. The growth period lasts 80–85 days, ripening is uniform and the seeds are similar to those of Algarrobo, but slightly smaller, do not change colour on storing and are good in cooking quality. It is immune from anthracnose and rust, highly resistant to *Isariopsis griseola* and is adapted to altitudes 1400–1500 m. above sea level.

2051 STOJANOVA, J.
(**The use of sexual hybridization in breeding French beans**).
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-Industr.) : 1958 : **3** : No. 2 : 1–6. [Bulgarian].

Mention is made of intervarietal F_1 hybrids bred at General Toševo. The following recommendations are made: (1) the proper time for emasculation is two days before the flowers open; (2) the flowers should be pollinated immediately after they have been emasculated, using pollen taken from flowers that opened on the same day; and (3) early flowers on the lower portion of the plants are the least liable to shed the ovaries.

2052 CALDERÓN GUEVARA, J.
The development and use of varieties of beans resistant to certain insect pests of legumes.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–2074 : p. 1931. (Abst.).

In breeding for resistance to *Apion godmani*, numerous crosses involving immune and resistant varieties and susceptible but commercially acceptable varieties have been made and the varieties Amarillo 155 [Yellow 155], Amarillo 156, Hidalgo 12–A–1 [Noble 12–A–1], Puebla 2 [Seed 2] and EAP–88B selected. No relation between resistance and morphological characters of the plant, pH of the pods or rust resistance was detected.

Among 12 varieties, resistance to *Hylemya cilicrura* decreased according to seed colour in the order black, pinto, yellow, white, tan. Resistant selections have been made.

The variety 11–II–R_1–14–20–2–3–U and some others from Mexico and the USA had a definite capacity for recuperation from leaf rolling caused by *Empoasca fabae* and tolerance of this insect was found in Fulgreen x Tendergreen, Contender, B–2920–2, B–3033–7–2, B–2932, B–2194–1–1, Pearlgreen, B–2446–1–6–3, Top Crop 10532 and Seminole.

2053 PUERTA, J. & ALONSO, A.
Pruebas de resistencia a diferentes enfermedades en diversas variedades de judías. (**Tests for resistance to different diseases in various French bean varieties**).
Bol. Inst. Invest. agron., Madr. 1958 : **18** : No. 38 : 37–48.

The resistance of 36 Spanish bean varieties to *Phaseolus* viruses 1 and 4, *Xanthomonas phaseoli*, *Pseudomonas phaseolicola*, *Uromyces phaseoli* races 1 and 1A and *Isariopsis griseola* was tested under greenhouse conditions at Beltsville, Md. Among the eight varieties of the dwarf dried-bean type, 225 (Del Barco de Ávila) and 355 (Alubias troncón) were resistant to virus 1, and 234 (Borriol) was resistant to *I. griseola*. Of the 13 climbing dried-bean varieties, 213 was immune from *I. griseola* and showed some resistance to both rust races and 70 (De la Virgen) was resistant to both mosaics, *I. griseola* and rust race 1 and immune from rust race 1A. Among the remaining varieties, which were of the climbing snap-bean type, resistance to the viruses and *I. griseola* was found in CS–27 (San Fiacre) and resistance to rust races 1 and 1A in 168–1–49 (De Manteca [Butter]), CS–3 (Avellaneta negra [Black Avellaneta]), 369–1–50

(Bonicas), 372–1–50 (Pinta oscura [Dark Spot]) and CS–30 (Genoll).

2054 SILVESTRE, P.
Note sur la production des légumineuses à graines alimentaires dans les territoires Français d'Outre-Mer et leur commerce avec la Métropole. (**A note on leguminous food crops in the French overseas territories and their trade with metropolitan France**).
Riz et Rizic. 1958 : **4** : 97–104.

A brief mention is made of mass selection of *Phaseolus lunatus* in progress in Madagascar, the aims being to eliminate all varieties containing HCN or producing coloured seed.

In French West Africa, a large collection of varieties of leguminous crops is being built up at Bambey. American varieties of *Vigna sinensis* are considered to be promising on account of their erect habit and short period of vegetative development; they produce their fruit before the pest *Piezotrachelus varium* occurs in large numbers. Trials with many populations of *V. sinensis* are to be carried out in different ecological regions of French West Africa; the best selections will ultimately be crossed with local varieties to combine the white seed colour of the latter with the desirable qualities of the American varieties. Similarly, selection for high yield, erect habit and white seed colour is being carried out with *Ph. lunatus* at Bambey. Also, selection of *Voandzeia subterranea* is to be effected. Treatment with radioisotopes is planned for *Dolichos lablab* and *Ph. radiatus*, with a view to obtaining dwarf and indehiscent forms respectively.

2055 ISBELL, C. L.
Two new purple hull crowder peas named and introduced in Alabama.
Seed & Gdn. Merch. 1958 : **21** : No. 10 : 16–17, 26.

Early Purple Hull and Knuckle Purple Hull, respectively coming into production 50 and 60 days after sowing, have been released by the Agricultural Experiment Station of the Alabama Polytechnic Institute. Both cowpea varieties were developed from local strains and are widely adapted in Alabama. Knuckle Purple Hull stands up well to transit and is particularly acceptable on account of the length of time it remains in a saleable condition. The pods and seeds of Early Purple Hull may become spoiled in transit but when not thus damaged, the variety also has a good "counter life."

2056 RAWLINGS, J. O., HANWAY, D. G. & GARDNER, C. O.
Variation in quantitative characters of soybeans after seed irradiation.
Agron. J. 1958 : **50** : 524–28.

Samples of seed of the Adams and Hawkeye varieties of soya bean were irradiated with X rays or thermal neutrons. All treatments significantly increased the genetic variability for yield, plant height, maturity and seed size in R_2 progenies; the estimates of genetic variance for the irradiation treatments were on an average five times as great as the corresponding estimates for the untreated controls. Also heritability estimates of these characters, with the exception of plant height, were considerably higher in the irradiation treatments than in the controls. Similarly genetic gains expected from selection were higher for all characters except plant height in the irradiated populations. Irradiation reduced mean yield in all cases, the distribution curves being shifted in the direction of lower yield. High-yielding genotypes are therefore not easily obtained from irradiated material.

2057 LEFFEL, R. C. & WEISS, M. G.
Analysis of diallel crosses among ten varieties of soybeans.
Agron. J. 1958 : **50** : 529–34.

All possible F_1 single crosses were made between 10 pure lines of soya beans at Beltsville, Md.; these lines had been selected for their high oil content of seed, desirable agronomic characters and diversity of parentage. Split-plot, combining-ability and diallel-cross analyses were carried out, the 45 F_1 hybrids and their parents being evaluated for 11 agronomic and chemical characters.

The three statistical methods were found to be similar in detecting lines showing an unexpected performance in the F_1 generation. "Dominance and mean performance of parents were both positively associated with their general combining ability. Mean complete dominance to overdominance was exhibited by yield and height, mean partial dominance by oil content of seed and seed size, and no or slight partial dominance by flowering, maturity, flowering to maturity, protein content of seed, iodine number of oil and seed quality and purple stain scores. Differences among crosses in apparent degree of dominance existed for many of the characters. No method utilized could be considered conclusive in distinguishing between allelic or non-allelic interactions of genes".

2058 Johnson, H. W.
Registration of soybean varieties, VI.
Agron. J. 1958 : **50** : 690–91.

Information is provided on the origin and characteristics of the following varieties, which have been recently registered by the US Department of Agriculture in cooperation with the American Society of Agronomy: Chippewa [XXVI, 2942], Clark [XXIV, 751], Grant [XXVI, 1903 and 2941], Jackson [XXIV, 749 and 1519], Lee [XXV, 616] and Norchief [XXV, 2512].

2059 Hartwig, E. E.
Hood, a new yellow seeded soybean of Ogden maturity.
Soybean Dig. 1958 : **18** : No. 10 : 18–19.
New soybean variety released for increase.
Seed World 1958 : **83** : No. 2 : p. 22.
New soybean of merit.
Agric. Res., Wash. 1958 : **7** : No. 3 : p. 15.
Hartwig, E. E.
Hood soybean variety has early maturity, higher seed yield.
Crops & Soils 1958 : **11** : No. 2 : p. 21.

Developed at the US Regional Soybean Laboratory at Urbana, Ill., from (Ogden x CNS) F_3 x Roanoke, Hood matures two days earlier than Ogden and exceeds the latter in seed yield by 6% in the East Coast area and by 9% in the Delta area. Oil content is slightly higher and protein content slightly lower than in Ogden. It is resistant to *Xanthomonas phaseoli* var. *sojense*, *Pseudomonas tabaci*, *Cercospora sojina* and *Corynespora cassiicola*.

2060 **Trends from the nation's capital.**
Seed & Gdn. Merch. 1958 : **21** : No. 9 : 13–14.

Shelby, a new variety of soya bean bred by the US Department of Agriculture at the US Regional Soybean Laboratory at Urban, Ill., in cooperation with the North Central States Agricultural Experiment Stations, is suitable for cultivation in Illinois, Indiana and Missouri. Its seed is superior in quality to that of Lincoln from which it is descended; Shelby is resistant to frog-eye leaf spot (*Cercospora sojina*).

2061 Sekizuka, S. & Yoshiyama, T.
(Studies of native Japanese forage plants. III. Differences in various characters between Japanese strains of *Glycine gracilis* after different sowing times).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **27** : 109–10. [Japanese].

Twelve strains collected throughout Japan were sown at monthly intervals from April to August. Wide differences in the period from sowing to flowering were observed [cf. XXVIII, 3117].

2062 Johnson, H. W., Means, U. M. & Clark, F. E.
Factors affecting the expression of bacterial-induced chlorosis of soybeans.
Agron. J. 1958 : **50** : 571–74.

It has already been shown that varieties of soya beans differ in their susceptibility to chlorosis in the presence of certain strains of *Rhizobium japonicum* [cf. XXVII, 4609]. Treatments involving modifications of the nutrient solution and sand substrate or removal of cotyledons had marked effects on the expression of the chlorosis. Whereas the most susceptible varieties developed a chlorosis in all the treatments, the less susceptible varieties showed light to moderate chlorosis in most treatments but appeared to be resistant in two cases. Other varieties previously considered to be resistant became chlorotic in some of the treatments.

2063 Probst, A. H. & Athow, K. L.
Additional studies on the inheritance of resistance to frog-eye leaf spot of soybeans.
Phytopathology 1958 : **48** : 414–16.

The resistance of Lincoln, Illini, Wabash and the experimental strain C1076 to *Cercospora sojina* proved to be controlled by the same gene. Data on F_2 and F_3 segregations in crosses of Chief and Perry with resistant varieties and in Perry x Chief indicated that the intermediate reaction of these two varieties was not conditioned by modifiers acting on genes for resistance. Because of the inability to differentiate between intermediate and highly susceptible reactions in this study, it was not possible to determine whether a gene for intermediate reaction was present or whether a gene for susceptibility was affected by modifiers. [Cf. XXIII, 2277].

2064 Isikawa [Ishikawa], M. & Miyahara, T.
(Resistance of soya bean varieties to *Heterodera glycines*).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 111–18. [Japanese].

Reaction to the above pest in an extensive set of varieties was determined in pot experiments in 1956–57. Most varieties proved susceptible but eight, all late varieties from the North-east region of Japan, were resistant. The connexion between resistance and various agronomic characters was investigated.

2065 Ross, J. P.
Host-parasite relationship of the soybean cyst nematode in resistant soybean roots.
Phytopathology 1958 : **48** : 578–79.

In Peking, a variety resistant to *Heterodera glycines*, no giant cells were observed in the invaded roots, the cells surrounding the head region of the larvae being necrotic. Adult males appeared in the roots but no fourth-stage larvae or adult females were observed. The reaction of Peking is regarded as a type of hypersensitivity.

2066 Slack, D. A.
Soybean cyst nematode.
Arkans. Fm. Res. 1958 : **7** : No. **3** : p. 2.

A source of resistance to *Heterodera glycines* has been found in a noncommercial variety of soya bean; attempts are being made to incorporate this resistance into commercial varieties.

2067 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1957, II. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety trials 1957, II. (In connexion with the Commission of the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuberg 1958 : **8** : 237–44.

The results of tests of pea varieties are reported.

2068 **Wisley trials, 1958.**
J. R. hort. Soc. 1958 : **83** : 483–87.

Descriptions are provided of some varieties of early culinary peas which received awards in the Wisley trials.

2069 North, C., Frith, L. H. & Taylor, H.
The assessment of yield in canning-pea varieties in Scotland.
J. hort. Sci. 1958 : **33** : 237–43.

Trials were carried out at Invergowrie during 1954–57 to determine yield and time taken to reach the "practical canning stage" (content of alcohol-insoluble solids at 13·5%) for the following varieties: Monarch Canner, Lincoln, Witham Wonder, Kelvedon Wonder, Wando, Canner's Perfection and Gregory's Surprise. Comparisons between texturemeter readings and contents of alcohol-insoluble solids suggested that the texturemeter is not a sufficiently accurate instrument on which to base decisions as to date of harvesting canning varieties under Scottish conditions.

2070 Barber, H. N., Jackson, W. D., Murfet, I. C. & Sprent, J. I.
Gibberellic acid and the physiological genetics of flowering in peas.
Nature, Lond. 1958 : **182** : 1321–22.

The effects of 18 and 9 hr. photoperiods, vernalization and nonvernalization and treatment of seeds with or without gibberellic acid were studied in Telephone (*Sn Le*), Greenfeast (*Sn le*), Alaska (*sn Le*) and Massey (*sn le*), in which *Sn* : *sn* controls late flowering *v.* early and *Le* : *le* determines tall plants *v.* dwarf; *Sn* also causes a small reduction in internode length. *Sn* varieties flowered at a lower node in long days and when vernalized, while *sn* varieties showed no response to either treatment. Gibberellic acid delayed flowering in all varieties but had a significantly smaller effect in *Le* varieties. There was no highly significant gibberellic acid x *Sn* interaction. A highly significant gibberellic acid x vernalization interaction in long days appeared to be due largely to the anomalous behaviour of Massey in this experiment. There was some evidence that in *Sn* plants gibberellic-acid treatment followed by vernalization may increase the effect of photoperiod. It is noted that gibberellic acid, like the gene *Sn*, not only affects flower initiation and internode length, but also delays the production of leaves with more than two leaflets, suggesting that *Sn* may be concerned in some way with gibberellic-acid metabolism.

2071 Hollowell, E. A.
Registration of varieties and strains of other legumes, I.
Agron. J. 1958 : **50** : p. 693.

Pisum arvense 'Papago', registered in the USA, originated as a selection made in 1934 from a seed lot obtained from the Papago Indian Reservation, Sells, Ariz. Released about 1940, it is recommended by the Arizona Agricultural Experiment Station as a winter green-manure crop.

2072 Kvasnikov, B. V., Dolgih, S. T. & Lebedjanceva, O. N.
(The carbohydrate and nitrogen content of vegetable varieties of pea and French bean differing in degree of nodule formation).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 599–604. [Russian].

A high content of carbohydrates and nitrogen in the vegetative organs of a variety was positively correlated with high nodulation, varietal differences in these respects between two early and two late varieties of peas being described.

2073 Roux, A.
Sortentypische Merkmale an den Blüten von Gemüseerbsen. (**Varietal characteristics in the flowers of vegetable peas**).
Züchter 1958 : **28** : 203–09.

Investigations on a collection of pea varieties cultivated in Federal Germany together with some foreign varieties revealed clear varietal differences in the size and form of the flowers; the base of the standard petal and the form and size of the two upper sepals were particularly useful in distinguishing varieties. It is now possible to recognize many pea varieties at the time of flowering. These investigations are similar to those carried out by Fourmont on French varieties [cf. XXVII, p. 169].

2074 Johnson, K. W. & Hagedorn, D. J.
The inheritance of resistance to bean virus 2 in *Pisum sativum*.
Phytopathology 1958 : **48** : 451–53.

Resistance to bean virus 2 depended on a single recessive gene, according to data from crosses of the susceptible varieties Perfected Wales and Thomas Laxton with the resistant varieties New Era, Pride, Wisconsin Early Sweet and Wisconsin Perfection. Deviations from a 3 : 1 ratio in some progenies are attributed to a probable delay in symptom expression in susceptible heterozygotes.

2075 Erwin, D. C.
***Fusarium lateritium* f. *cicera*, incitant of Fusarium wilt of *Cicer arietinum*.**
Phytopathology 1958 : **48** : 498–501.

Resistance to a Californian strain of the above pathogen was found in the Californian selection E–1 and to a lesser extent in the Ethiopian varieties PI 226943, 226944 and 226945. E–1 was also resistant to a less virulent Indian isolate.

2076 Patil, J. A. & Sandbhor, N. V.
'Chimera' in tur (*Cajanus cajan* Millsp.).
Curr. Sci. 1958 : **27** : p. 358.

Chimeras have been observed in the progeny of a cross between two mutants, a creeping and a round-leaved type. It is thought that this is the first time the occurrence of chimeras has been reported for *C. cajan*.

2077 Brett, C. H.
Resistance of sweet corn varieties to insects.
J. Elisha Mitchell sci. Soc. 1958 : **74** : 85–86. (Abst.).

Differences in degree of resistance to ear worm, Japanese beetle, sap beetles (Nitidulidae) and autumn army worm were found among the 30 commercial varieties tested in 1957. Infestation by ear worm, measured on the basis of percentage of ears infested and damage per ear, ranged from 34 to 88%. It was not correlated with egg deposition or length of husk beyond the ear tip. Apparently many factors are involved in ear worm resistance and these may differ for each variety.

2078 Gonzalez del Valle, C. E.
Testing selected sweet corn hybrids for earworm resistance and sugar content and tenderness under different storage temperatures.
Diss. Abstr. 1958 : **18** : LC Card No. Mic 58–1521 : p. 1560. (Abst.).

Investigations of eight sweet corn hybrids at Louisiana State University revealed no positive valid correlation between the husk extension character of the ear and injury by *Heliothis*. Observations made on three of these hybrids and one variety "showed a positive valid correlation between the tight condition of the husk and corn earworm damage". These results were not consistent; in other years and other localities, the tight husk condition provided no significant protection against earworm damage.

Another study showed that hybrids with high initial total sugar content lost more sugar during a 96 hr. storage period than those with lower initial sugar contents; the former still contained more sugar at the end of the storage period. The hybrids of low sugar content are said to have the highest sugar retention capacity.

A third investigation was concerned with finding at which of three storage temperatures 12 hybrids retained their tenderness to the greatest extent; also the influence of pericarp and endosperm characters on tenderness was studied.

2079 Ikeda, N. & Udo, S.
(Studies on mint breeding. IX. Studies on the F_1 hybrid between Japanese mint and *Mentha arvensis* L. of European provenance).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 69–74. [Japanese].

A description is given of the morphology and cytology of the F_1 hybrid between a strain of *M. arvensis* from the Antwerp Botanic Garden ($2n = 72$) and Japanese mint ($2n = 96$). The hybrid tended to be intermediate between the parents in most respects and was rarely infected by rust. The modal meiotic configuration was $2n = 84 = 36_{II} + 12_{I}$, suggesting that the parents had three 12-chromosome genomes in common.

A male-sterile clone was noted in the European sample, this characteristic being inherited by half the offspring in the cross with Japanese mint. [Cf. XXVIII, 2401–2].

ECONOMIC LOWER PLANTS

2080 ALIHANJAN, S. I. & IL'INA, T. S.
(Mutagenic effect of actinophage).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958 : **19** : 348–56; and Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : No. 5 : **1112–25**. [Russian].

The frequency of morphological mutations in strain H6 of *Actinomyces* (*Streptomyces*) *olivaceus* induced by actinophages was in some cases as high as 98% and 2·8 times higher than that obtained by X irradiation. Each phage had a specific mutagenic effect. The specificity of the mutational spectrum was determined by the genetic characteristics of the *Actinomyces* culture in which the phage was reproduced. Among the mutants resulting from the action of phage 1 there were many + variants in respect of production of vitamin B_{12}.

2081 VERBINA, N. M.
(Some peculiarities in development of *Aspergillus nidulans* variants produced by ultraviolet radiation).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 164–71. [Russian].

Mention is made of induced variants n/7, n/34 and n/24^3 which break down proteins more actively than the initial strain in surface and submerged cultures.

2082 KANIE, M.
α-Amylase formation by *Aspergillus*.
Mem. Fac. Agric. Kagoshima Univ. 1956 : **2** : 35–121.

The paper reports investigations carried out on the metabolism of α-amylase formation by *A. kawachii* with the aim of furthering industrial production of the enzyme. It includes a section on ultraviolet-induced mutants. Although the majority of these showed a reduction in capabilities for acid and α-amylase production, a few represented improvements in these respects over ordinary strains.

2083 GERSCH, L.
Versuche zur Gewinnung von strahleninduzierten Mutanten an Aspergillaceen unter besonderer Berücksichtigung der antibiotischen Wirksamkeit. **(Experiments on the production of radiation-induced mutants in the Aspergillaceae, with special reference to antibiotic activity).**
Zbl. Bakt. 1957 : **110** : 548–62.

X irradiation of spore suspensions of *Penicillium* strains 246 and 325 at 100,000 r. gave rise to mutants with increased antibiotic activity against staphylococci, associated with increased mycelium formation. Colour and growth mutants were obtained both in these strains and in *Penicillium* '295', *Monoverticillium strictum* '244', *Asymmetricum* '256' and *Aspergillus* '306'.

2084 BEKKER, Z. Ė. & MAKSIMOVA, P. A.
(Morphological variability and antibiotic properties of strains of *Penicillium chrysogenum* Thom. and *P. notatum* Westl. isolated from various districts of the USSR).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 157–63. [Russian].

Differences in morphological and antibiotic properties between strains from diverse geographical locations are described. Mention is made of extreme variants from the Pamir-Alaj region which are thought to be undergoing specific conversion; they form coremia and have partly lost the capacity for producing penicillin.

2085 KASATKINA, I. D.
(The selection of pigmentless strains of *Penicillium chrysogenum* INMI243).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : No. 1 : 39–45. [Russian].

A strain which produces penicillin but does not synthesize yellow pigments was selected among ultraviolet-induced variants of INMI243.

2086 EMEIS, C. C.
Die Gewinnung von Askosporenmassen von *Saccharomyces*-Arten auf Grund besonderer Oberflächeneigenschaften.
(The mass extraction of ascospores of *Saccharomyces* species based on special surface properties).
Naturwissenschaften 1958 : **45** : p. 441.

A method is described for separating spores from vegetative cells, use being made of the lipophilic properties of the spore surface. Treatment with glass powder in a homogenizer releases the spores from the asci; shaking with paraffin then separates the spores from the other cells and asci. The paraffin suspension of spores may be plated out directly on to nutrient media; the paraffin does not impair the germinating capacity. By this method it is possible to obtain a large number of single-spore cultures from yeasts of low sporulating capacity; the procedure will be useful for genetical investigations of brewers' yeasts.

2087 JAMES, A. P. & SPENCER, P. E.
The process of spontaneous extranuclear mutation in yeast.
Genetics 1958 : **43** : 315–31.

The production of spontaneously occurring respiratory-deficient mutants, extranuclear in origin, was studied in the unstable strain 4572 of *Saccharomyces cerevisiae*. Rates of change in the diameters of microcolonies, as measured by the microscope, were used to estimate the relative stability of individual cells. Mutation to respiratory deficiency was found to be lethal in the absence of a mutant gene. Cell populations were heterogeneous in respect of stability. It was also shown that the induction of respiratory deficiency occurs as a multiple process in each step of which the instability of the cell increases. Stability is thought to be dependent on the number of cytoplasmic particles in the cell. In the lines sampled, instability tended to increase. A possible explanation of this is that the rate of division of cells and chromosomes is higher than that of cytoplasmic particles so that the number of particles per cell is gradually lowered. This theory is supported by the correlation observed between restoration of stability and reduced rate of cell division, the latter being caused by genic or environmental change. There seemed however to be no exact synchronization of cell and particle multiplication. Also there appears to be no mechanism for determining a precise distribution of cytoplasmic particles at cell division.

2088 DERBINEVA, T. G.
(The effect of ultrasound upon fermenting ability of wine yeasts).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 6 : 12–14. [Russian].

The F_3 and F_4 of an unidentified strain, subjected to ultrasonic treatment for 40 min., fermented at a higher rate than untreated controls, but later generations showed a reduction in fermenting ability until this ceased altogether in the F_7.

2089 RUDIN, A. D.
Finings. II. Dependence of the fining behaviour of yeast on surface charge.
J. Inst. Brew. 1958 : **64** : 392–94.

The electrophoretic mobilities and fining reactions were determined for a series of yeast strains in dilute buffer solutions, the yeasts having been grown in a malt extract medium; under these conditions a close correlation existed between the level of charge and the response to finings. Strains differed in the effect that various pH values had on the electrophoretic mobility. Other studies indicated that the effective part of the charge on the yeast surface is contributed by bound phosphate groups.

2090 SARACHEK, A.
Studies of the induction by ultraviolet radiation of heritable respiratory deficiencies in polyploid *Saccharomyces*.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–1266 : p. 1588. (Abst.).

The following evidence indicated that the extrachromosomal respiratory determinants of yeast reside in the nucleoplasm: "(a) The rates of induction of respiratory deficient variants were integrally related to polyploidy. Nucleic acid analyses showed that this correspondence was determined by the DNA and not the RNA content of the cell. (b) During the budding cycle, the susceptibility of cells to the permanent loss of respiratory capacity followed the fluctuations in the cellular DNA content and was independent of changes in the cellular RNA content. (c) The induction of respiratory deficiency in aerobically propagated cells was depressed greatly by post-irradiation illumination with visible light.

"Analyses of the survival curves of polyploid yeasts and the kinetics of inactivation of cells at different stages of the budding cycle revealed that cellular inactivation also resulted from nuclear damage. However, the degree of photoreactivation of inactivation damage was independent of both the ploidy and respiratory activity of the cell. In contrast, the induction of variants was photoreversible only in aerobically grown cells and the extent of photoreactivation increased with increasing polyploidy. It was concluded, therefore, that inactivation and the induction of respiratory variants resulted from damage to different nuclear sites. A possible functional association between these sites was indicated by the demonstration that the phase of logarithmic cellular inactivation marked the periods of both the mutational and inactivational dose-response curves during which the last critical sites maintaining survival and the respiratory mechanism were destroyed."

2091 NAGAI, S. & NAGAI, H.
Demonstration of the induction of respiration-deficient yeast by manganese using a selective culture medium.
Naturwissenschaften 1958 : **45** : 441–42.

The induction of respiratory deficiency in yeast by manganese was shown, using a glycerol culture medium [cf. 1204].

2092 Kosikov, K. V. & Raevskaja, O. G.
(The effect of the concentration of a specific substrate upon variability of fermenting properties in yeasts).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **119** : 1225–28. [Russian].

Cells of *Saccharomyces globosus* capable of fermenting sucrose were obtained by culturing in solutions with different concentrations of sucrose. A graph shows the effects of different concentrations upon fermenting ability, with the highest proportion of cells fermenting sucrose, 36·5%, occurring in a 34% solution.

2093 Royan, S.
Chromocenters and nucleolar equivalents in the yeast nucleus.
Curr. Sci. 1958 : **27** : 400–01.

In smears of cells fixed in iodine-formaldehyde - acetic acid or Carnoy's fluid as modified by Lindegren *et al.*, stained with Giemsa, differentiated in 20% alcohol and examined as water mounts, the cytoplasm and nuclear membrane were blue while the intranuclear structures were separable into red-stained chromocentres and blue-stained nucleolar components.

2094 Sarachek, A.
The free amino acid contents and growth rates of polyploid *Saccharomyces*.
Experientia 1958 : **14** : 360–62.

The rate of cell division was found to be independent of ploidy, whereas the quantities of free aminoacids in the cells increased directly with increasing polyploidy.

2095 Olsen, R. A.
A comparison of strains of *Saccharomyces* carrying isolated polymeric sucrose genes.
Diss. Abstr. 1958 : **18** : LC Card Mic 58–2141 : p. 1951. (Abst.).

Interstrain differences in fermentation of raffinose, hydrolysis of sucrose and raffinose and inducibility of invertase were found among six strains each carrying a single gene controlling sucrose fermentation. Genetic studies showed that high affinity for raffinose segregated with the *Su*–1 gene while the property of thermolability was not exclusively under the control of this gene.

2096 Tavlitzki, J.
Étude des thiamine-pyrophosphatases extraites de souches de *Saccharomyces cerevisiae.* **(Study of thiamine pyrophosphatases extracted from strains of *S. cerevisiae*).**
CR Acad. Sci., Paris 1958 : **247** : 1405–07.

Thiamine pyrophosphatase from strain 276_3b showed optimum activity at pH 2·7 while that from strain 276_3d was most active at pH 8·4–88. The enzymes were entirely specific to the respective strains and each appeared to be under the control of a single gene.

2097 **European Brewery Convention: Yeast Colloquium.**
J. Inst. Brew. 1958 : **64** : 367–69.

Lund, in speaking on Properties of bottom fermentation yeasts, mentioned that strains differ in attributes such as autolysis rate, sulphide production and possibly bacteriostatic power towards *Pediococcus.* Two brewery yeasts were examined; the flocculent strain which gave satisfactory crops did not achieve adequate attenuation limits, whereas the powdery yeast gave poor crops but good attenuation and after-fermentation. From the powdery yeast, a spontaneous mutant was isolated combining the good properties of both the powdery and flocculent yeasts; this flocculent mutant has remained stable for six years and is particularly suitable for brewery fermentation. Methods used in breeding improved yeast strains were also mentioned.

Curtis outlined the properties of the ideal pitching yeast, mentioning that yeast strains appear to vary in their ability to suppress growth of *Flavobacterium.* The type of yeast head produced is influenced both by the yeast strain and the nitrogen content of the wort. It was also considered that laboratory examinations give insufficient information on the characteristics of a yeast strain, brewery fermentations being necessary.

Eddy reported that considerable strain differentiation may be made on flocculation characteristics.

2098 Thorne, R. S. W.
Statistical survey of the fermentation efficiencies of a large number of strains of brewery yeasts and a consideration of the utility of these efficiencies in classification.
J. Inst. Brew. 1958 : **64** : 411–21.

Examination of about 400 strains of bottom and top fermenting yeasts of the species *Saccharomyces carlsbergensis* and *S. cerevisiae* respectively revealed that the bottom yeasts have a markedly higher average fermentation efficiency than the top strains and form a more homogeneous group. Amongst the top strains, three subgroups were distinguished; the distillery yeasts had a higher average fermentation efficiency than the British (mostly ale) yeasts and these latter were superior in this respect to the continental yeasts. Of the bottom strains, those preferred in practice formed a more homogeneous group than the other bottom strains and their average fermentation efficiency was considerably higher. These studies show that fermentation efficiency is a continuously variable character, there being no evidence of any natural grouping of the strains about a few preferred values.

The value and limits of an artificial classification of yeast strains based on fermentation efficiency are discussed.

2099 Teodorescu, Ş., Şeptilici, G., Jurubiţă, J. & Eberhardt, F.
Suşe de drojdii pentru prepararea vinurilor spumoase in R.P.R. Comportarea la fermentare. **(Cultures of yeasts for the preparation of sparkling wines in the Rumanian People's Republic. Behaviour during fermentation).**
Bul. Şti. : Secţ. Biol. Şti. agric. : Ser. Agron. 1957 : **9** : 213–22.

Five foreign and five Rumanian strains were compared. The most satisfactory were the Rumanian strains Sauvignon Crăciunel, and Grasa Cotnari 10 which induced a slow fermentation, sparse deposit and high gas pressure.

2100 Santa María, J.
Ecología de las levaduras. I. Nuevas especies aisladas de alpechín. **(Ecology of yeasts. I. New species isolated from expressed olive juice).**
Bol. Inst. Invest. agron., Madr. 1958 : **18** : No. 38 : 301–13.

The three new species *Saccharomyces oleaceus*, *S. oleaginosus* and *Candida olivarium* are described.

2101 Karasevič, Ju. N.
(An experimentally produced variant of *Saccharomyces cerevisiae*, which does not utilize alcohol).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : No. 1 : 53–59. [Russian].

An ultraviolet-induced mutant of the Rostov strain multiplied at a higher rate than the initial yeast when grown on wort under aerobic conditions, but lost its capacity to reproduce in ethyl alcohol.

2102 Wickerham, L. J.
Sexual agglutination of heterothallic yeasts in diverse taxonomic areas.
Science 1958 : **128** : 1504–05.

Hansenula wingei, an unidentified species (NRRL Y–2408), *Citeromyces matritensis* and *Saccharomyces kluyveri* show an agglutinative reaction when cells of opposite mating types are mixed in liquid or on solid media. Attention is drawn to the potentialities of the last-mentioned species, not only for industrial purposes but, on account of its pronounced sexual reaction and the high frequency with which it produces polyploids, also for genetical studies.

2103 Karasevič, Ju. N.
(Adaptation of yeasts to pentoses 1. The conditions required for the adaptation of *Candida tropicalis* to arabinose).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 145–49. [Russian].

Industrial strains of *C. tropicalis* and *Monilia murmanica*, grown for a prolonged period on a medium with arabinose as the only source of carbon, became capable of utilizing this substance. The changes are attributed to enzymatic adaptation.

2104 Seliverstova, L. A.
(Increasing the synthesis and accumulation of inositol in yeast organisms by means of X irradiation).
Mikrobiologija (Microbiology), Moskva 1958 : **27** : 575–80. [Russian].

By treating strains of *Saccharomyces cerevisiae* and *Torulopsis utilis* with doses of 60 or 100 kr., progenies were obtained which synthesized and accumulated inositol more actively than the initial cultures.

2105 Cox, D. R.
Planning of experiments.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1958 : 60s. : Pp. vii + 308 : figs. : tables.

This is a book about modern work on statistical aspects of experimental design, and is written for the experimental worker. Its principal feature is the great care that is devoted to lucid explanations of the basic ideas. After an introductory first chapter, the key assumptions—additivity, constancy and noninterference of the treatment effects—are explained. The next two chapters discuss means for the reduction of error, for example by using randomized blocks or supplementary observations. The thorny problem of randomization is well discussed in chapter five. Factorial experiments are introduced in the next two chapters, and remarks on the choice of number and type of observations in chapters eight and nine. The remaining five chapters deal with more specialized topics, such as confounding. Some tables of random permutations and random digits, and a good index conclude the book.

The experimental worker will find this book to be of the greatest value to him. There is practically no use of mathemetical symbolism to disturb those who are easily put off by such language, and the argument never suffers from its exclusion. The style is good. There is practically no statistics in the book. A few elementary ideas from that subject are necessarily included but for further details the reader is urged to consult one of the many books on statistical methods or a statistician. This is a book on the planning of experiments, not on their analysis. There are copious examples, drawn from many fields, to illustrate the ideas being explained. Perhaps the most important feature of the book is the care with which the assumptions being made in using modern designs are explained. The effect could be to confuse the reader with qualifications and disturb him with doubts, and perhaps for this reason many authors prefer to leave the assumptions unstated. But the reader of this book will surely acquire added confidence in his experimentation because he has understood them and can appreciate their relevance. The book can be warmly recommended to every scientist who is going to perform experiments which include fluctuations outside his control. Its wide dissemination should do much to improve experimentation in such circumstances. Even the expert who can read the more advanced books on the subject would be well advised to read it: his understanding of the subject will surely be increased.

D. V. Lindley

2106 Extermann, R. C. (Editor)
Radioisotopes in scientific research. Vol. 4. Research with radioisotopes in plant biology and some general problems.
Pergamon Press, London 1958 : £7 : Pp. xxi + 690 : figs. : tables.

At the First (UNESCO) International Conference on Radioisotopes in Scientific Research, held in Paris in September, 1957, more than 200 papers were presented. The proceedings have been issued in four volumes, devoted respectively to the use of isotopes in research in physics and industry, chemistry and geology, human and animal biology and medicine and, lastly, plant biology. Volume IV, on plant biology, contains the texts of the inaugural addresses by Prof. P. Auger, Sir John Cockcroft, F. Benard and L. H. Evans, in addition to the full texts of papers, over 50 in number, read at the session on plant biology, together with the discussions. The papers, some of which are in French and some in English, are provided with an abstract in English, French, Spanish and Russian. They cover a wide range of topics, including such varied subjects as the study of photosynthesis in higher plants; synthetic processes in yeast; sulphur metabolism in fungi; the uptake of C, K and various trace elements from the soil by plant tissues and their translocation in various plants, including red beet, sugar cane and fruit trees; metabolism in root tissue; the synthesis of lipids, alkaloids, terpenes and rubber; tissue culture in plants; and the application of radioactive isotopes in the study of plant fertilization. The last-named paper, by I. M. Polyakov, A. N. Dmitrieva and A. F. Zdrilko, describes studies of fertilization in plants of *Nicotiana tabacum*, *N. rustica*, *N. longiflora*, *N. sylvestris*, *Gossypium hirsutum*, *Hibiscus cannabinus*, maize, peas and other plants, pollinated with pollen labelled with S^{35} or P^{32}, applied at varying times after pollination with normal pollen. In the experiments with cotton, the varieties 1306 and 18819 served as seed parents and Krasnolistnyj [Red-leaved] and Razreznolistnyj [Dissected-leaved] as pollen parents, the two pollen parents being distinguished by dominant characters. When the labelled pollen was applied 6 hr. after the normal pollen, the progeny contained not more than

10% of hybrid plants, as shown by the presence of dominant characters from the pollen parent; applications after a longer interval produced only 2–3% of hybrids. Nevertheless, a certain degree of radioactivity was detected in the resulting seeds, even in those that did not appear to be hybrids, the amount diminishing roughly in proportion to the time lag before application of the labelled pollen. In pollinations of *N. rustica* 'Yellow 109' with labelled pollen of 'High Green', the proportion of hybrids was not more than 4% but the seeds that developed showed radioactivity, again inversely proportional to the time lag before application of the labelled pollen. Similar results are reported from the experiments with the other species. A comparison of the amount of P^{32} in the pollen and the resulting seeds leads to the conclusion that radioactive materials had passed into the developing seed from pollen grains varying in number from 3 to 8.

In pollinations with labelled pollen of other species a certain amount of radioactivity also appeared in the resulting seeds, the amount being considerably greater when the foreign pollen was applied in mixtures with pollen of the maternal type; 70% or more of the radioactivity transmitted by the foreign pollen was localized in the embryo and endosperm of the resulting seeds and data are presented in support of the view that it is transmitted in the form of complex organic compounds which may penetrate from the pollen grain to the developing seed even after double fertilization has been effected. In experiments in which the style was cut at different times after pollination it was shown that the marked increase in radioactivity in the ovaries occurred only after the pollen tubes had penetrated and very little radioactive material was conveyed into the ovaries by diffusion down the style. In various interspecific combinations of *Nicotiana*, the amount of radioactivity transmitted to the ovaries by pollination with labelled pollen of incompatible species, whose pollen tubes do not grow to the base of the styles, was much less than that by labelled self pollen.

2107 WINCHESTER, A. M.
Genetics. A survey of the principles of heredity.
Houghton Mifflin Co., Boston 1958 : 2nd Ed. : $6.25 : Pp. xiii + 414 : figs. : tables.

The aims of this new edition remain similar to those of the first [cf. XXII, p. 312], viz. to present to the student who is not specializing in genetics the principles of heredity and their application, in a manner which will catch and hold his attention. The plan of the book is the same as in the first edition, but there is a new chapter on bacterial genetics and bacteriophages and many of the existing chapters, notably those on statistics, on the nature of genes and on radiation hazards, have been expanded by the addition of new illustrations and the incorporation of new textual material. The number of problems appended to each chapter has also been increased. Of its kind, the book can perhaps hardly be bettered. Its explanations are clear and concise, it covers all the basic ground while avoiding controversial matter, the illustrations are excellent and many of the genetical principles mentioned are exemplified by reference to human genetics, which is, after all, what chiefly interests the nonspecialist seeking general information on genetics.

2108 RUGGLES GATES, R.
Taxonomy and genetics of Oenothera.
Uitgeverij Dr. W. Junk, Den Haag 1958 : f. 14 : Pp. 115 : 20 figs. : 7 tables : 2 maps.

The chromosome catenations in the evening primrose were the cause, though the fact was not appreciated at the time, of the "mutations" on which the original mutation theory of de Vries was based in 1901. It is appropriate therefore that the genus *Oenothera*, on which R. Ruggles Gates has been working since 1907, should form the subject of this monograph, which the author describes as a study of "taxonomic genetics, on a large scale and of the most intensive character".

Studies of collections from eastern Canada and the USA have shown the great range of natural types that exists. Much of the text is taken up by descriptions of these types and a discussion of their taxonomic relationships. The primary function of taxonomy, we are told, is "to classify hereditary phenotypes, describe them and apply names to them, so that others can identify the same or similar forms from his description". One is a little taken aback at the assertion that the splitters in taxonomy "inevitably include the geneticists". Such a statement suggests ignorance of the important contribution of the geneticists to the taxonomy of such genera as *Gossypium* in which the plethora of species created by taxonomists has been drastically reduced and brought into some sort of order. This notwithstanding, the author does in fact reduce the number of species recognized and many forms are classed as subspecies, varieties or lower categories, some of the differences having been shown to be conditioned by a single gene or a small group of genes.

The results of the study, taken together with those of other investigators, shed some light on the evolution of the genus and its near relatives. The present distribution can be accounted for by migration from some centre in the southern USA or South America, accompanied by repeated mutations for small flowers, which have a selective advantage in their greater ease of self pollination. As the small-flowered forms mostly have a ring of 14 chromosomes, combined with balanced lethals, a state of heterosis is maintained in spite of self pollination. In fact there seems to be a general trend towards reduction in the Onagraceae as a whole, culminating in *Circaea alpina* with only one seed per flower. Many of the stages in this reduction process as manifested in the different genera of the family can be paralleled by mutations in *Oenothera* itself. The tendency towards ring formation is shared with other genera but seemed to arise only in the Pleistocene period or later; before that time the species had evidently evolved in the ordinary way, with 7 free pairs of chromosomes. The introduction of this new mechanism enabled the genus to enter into an entirely new era of rapid evolution.

The first form to be introduced to Europe was apparently *Oe. muricata*, which reached England shortly before 1612, whence it spread to the continent of Europe, in many parts of which it became naturalized. How the famous *Oe. lamarckiana* originated is apparently still an unsolved mystery. Several new species have however arisen since the genus was introduced into Europe and its evolution seems to be still progressing fairly rapidly.

The special nature of chromosome pairing in this group of plants, where it tends to be confined to the chromosome ends and hence favours ring formation, is discussed in a final section, before the conclusions and summary.

2109 BODENHEIMER, F. S.
The history of biology: an introduction.
Wm. Dawson & Sons Ltd., London 1958 :
42s. : Pp. 465 : 38 figs. : tables : plates.

Professor Bodenheimer has achieved distinction in two fields: zoology, and the history of science. In the latter, he has specialized in medieval Jewish science and has produced a highly useful version of the encyclopedic *Sha'ar ha-Shamayim* [*Gate of Heaven*] of Gershon ben Shlomoh of Arles.

The present volume is a further contribution to the history of science and consists of three sections: I, a general consideration of the nature of scientific method and the status of scientific conclusions as revealed by a study of the history of science, II, a short synopsis of the history of biology, and III, short illustrative passages excerpted from 133 authors of special significance in the history of biology.

It is perhaps too much to expect that the introductory section could deal thoroughly with its subject within 79 pages. However, some good points are made, in particular the importance that scholastic logic had in providing the groundwork for scientific argumentation, and the long life of scientific error, especially when sheltering under an eminent name. In the historical synopsis, Professor Bodenheimer appears to accord a rather inordinate veneration to Aristotle's biological views and this leads him later on (p. 162) to the erroneous conclusion that Platonism has been uniformly detrimental to biology. This was emphatically not so in the late Renaissance when active chemical and biological experimentation was being undertaken by neo-Platonists such as van Helmont in the face of persistent opposition by entrenched Aristotelians.

The third section is the most valuable part of the book. The sources are well chosen and range from a Sumerian lexicon of animal names of the 9th century BC to T. H. Morgan on *The Mechanism of Mendelian Heredity*. In one case—a passage on ants from the *Kitab al-Hayawan* [*Animal Book*] of Jahiz of Basra, hitherto untranslated—a translation has been made from the Arabic by Dr. L. Kopf. In other cases, already-published versions have been utilized, translated wherever necessary into English. This procedure has resulted in a number of cases in translations several removes from the original, which is unsatisfactory in an historical source book. Perhaps the worst example of this is on p. 177 where Dioscorides, instead of being translated direct from the Greek, is translated from a Hebrew version, itself presumably derived from an Arabic translation. A less serious though more irritating drawback of the whole book is the quality of the English and the spelling. It is not to be expected that the author should excel as an English stylist but it would have been a simple matter to arrange for an English writer to put the text into something more closely resembling standard English and to substitute say, *Plato* for *Platon*, *Istanbul* or even *Constantinople* for *Byzanze* and *invertebrate* for *evertebrate*.

There are so many common misconceptions about the history of biology that the contact with sources which this book supplies can only be salutary. It should provide a useful adjunct to the various histories of biology in current circulation.

2110 Stopp, K.
Die verbreitungshemmenden Einrichtungen in der südafrikanischen Flora. (**Dispersal-inhibiting mechanisms in the South African flora**).
Gustav Fischer Verlag, Jena 1958 : Bot. Stud. No. 8 : DM 10.65 : Pp. 103 : 76 figs.

Zohary, in a study of reproductive behaviour in the desert flora of Israel, developed the notion of antitelechory, by which he meant the tendency to restrict dispersal rather than expedite it. While wide dispersal may be of value under mild climatic conditions, under extreme conditions, such as obtain in torrid deserts, it may be disadvantageous. Dr. Stopp has extended these observations to the deserts of south-west Africa, where, during 1950–1, he was able to examine the reproductive mechanisms of the indigenous flora at first hand. Many antitelechoric species were encountered and these could be classified into three categories, basicarpic, geocarpic and amphicarpic, according to whether the units of reproduction were deposited on the ground surface, under the earth, or both, respectively. Basicarpy is not necessarily antitelechoric; examples are given where it is associated with dissemination by ants or with the creeping habit.

Dr. Stopp's study is accompanied by some excellent illustrations and will prove of particular interest to botanists concerned with the interrelations of natural selection, environment and plant dispersal.

2111 Săvulescu, T. (Editor)
Flora Republicii Populare Romîne. (**Flora of the Rumanian People's Republic**).
Editura Academiei Republicii Populare Romîne 1955 : **3** : Lei 28, 30 : Pp. 662 : 104 figs.; 1956 : **4** : Lei 38, 85 : Pp. 958 : 164 figs.; 1957 : **5** : Lei 44 : Pp. 551: 95 figs.; 1958 : **6** : Lei, 39, 80 : Pp. 676 : 123 figs.

The cardinal importance of the Balkan peninsula and of the Carpathian range in studies of the historical development of the European flora is generally recognized. The new Rumanian flora, six volumes of which have been published, provides a major contribution to our knowledge of the existing flora in these regions and will prove indispensable for all students of the taxonomy and plant geography of European higher plants.

Attention is not confined to indigenous plants; economic crops and ornamental plants commonly grown are also included. Each species receives a detailed botanical description, followed by notes on habitat, a minute account of the distribution within Rumania and a more general account of the distribution elsewhere. Vernacular names in Rumanian, Hungarian, German and Russian are given. Each species is adequately figured. Keys are provided to genera and species.

The care devoted to intraspecific variation is a feature of special value. The botanical varieties of each species are keyed out and localities are cited. Keys are also provided to cultivated varieties of crop plants though here, as might be expected, the varieties exemplified are only a fraction of the total grown in Rumania. Notes are added on economic uses, including medicinal, and in the case of economic plants, the major pests and diseases are briefly described.

Vol. III comprises the latter part of the Ranales, Rhoeadales and Parietales, IV, Guttiferales and Rosales, V, Leguminales and Myrtales, and VI, Columniferales, Gruinales, Terebinthales, Celastrales, Rhamnales and Umbelliflorae.

2112 Flore du Congo Belge et du Ruanda-Urundi. Spermatophytes. Tableau analytique des familles. (**Flora of the Belgian Congo and Ruanda-Urundi. Spermatophytes. Analytic table of the families**).
Institut National pour l'Étude Agronomique du Congo Belge, Bruxelles 1958 : Pp. 67.

The separate parts of this important flora have been reviewed *passim* as they have appeared [cf. XXVIII, 4938]. The above is a key to the 189 spermatophyte families at present recognized in the Belgian Congo and Ruanda-Urundi. The characters utilized are mainly features that are readily observed but the key is only designed to differentiate between the families in as far as they are represented in the region covered.

2113 **The world of learning 1958-59.**
Europa Publications Ltd., London 1958 : 9th Ed. : £6 10s. : Pp. xiii + 1139.

Readers of *Plant Breeding Abstracts* will need no introduction to this work which, since it first appeared in 1947, has become deservedly well known as a very useful guide to scientific, educational and cultural organizations throughout the world and their principal personnel. The ninth edition follows the pattern of its predecessors [cf. XXVIII, 1083] but has been expanded throughout. As pointed out in the foreword, this expansion has been dictated not only by the world-wide intensification in research but also by the foundation of universities and colleges in formerly undeveloped countries and the increased study of advanced technology. Indexing such a work obviously raises a number of problems. In the present edition, the combined table of contents and subject index found in the previous edition have been discarded in favour of a list of contents referring to countries only, while an index of institutions makes it reappearance. The information within each country is however so clearly arranged that enquirers should experience no difficulty.

2114 Norman, A. G. (Editor)
Advances in agronomy. Volume X.
Academic Press Inc., New York and London 1958 : $12.50 : Pp. xii + 547 : figs. : tables.

Having arrived at the tenth volume of this useful series [cf. XXVIII, 2421], the editor has decided that some topics are due for brushing up and being brought up to date. This is done by W. L. Nelson and G. Stanford in Changing concepts of plant nutrient behaviour and fertilizer use. There is a contribution by E. C. Stakman and H. A. Rodenhiser on Race 15B of wheat stem rust—what it is and what it means; from this survey we see that race 15B was probably present in the USA long before 1939 but was not identified because there were no suitable differential hosts. Some of the reasons for its sudden spread in 1950, at a time when the problem of resistance seemed to have been solved, are explained. As to the population of biotypes that was later discovered to exist within race 15B, it is stated that "there are extremely important differences between them, but exactly what these differences are and how important they are can be determined only by much more research." Moreover the situation in race 15B can now be paralleled in several other complexes of races found in Mexico and elsewhere, in races 7 and 8 of oat stem rust, in crown rust of oats and in several other parasites. The importance of intensifying the campaign against the alternate hosts, on which many of the new biotypes obviously arise by segregation, is stressed. The suggestion is also put forward that less reliance should be placed on specific resistance to a given group of biotypes and more attention given to some form of generalized resistance, such as adult-plant resistance, which protects the plant from infection whatever the biotype may be. The need for the use of chemical treatments too is not altogether ruled out. It is surprising however, in this frank review of what in many ways must be regarded as a succession of glorious failures, that no mention is made of a further alternative that is already meeting with a certain amount of success, namely the use of mixed populations.

A composite review of Agronomic trends in the Great Plains is coordinated by R. V. Olson. It includes information on the field crops now grown there, and their varieties; we read for instance that by breeding adapted sorghum varieties the area where this crop is grown has been extended about 400 miles northward; new hybrid sorghums, which are earlier and more productive, are being developed. Most of the wheats grown stem directly or indirectly from Turkey, introduced from Russia in 1873, or from Marquis, introduced from Canada in 1912. In grasses too, new varieties and an extended range of species are beginning to play a part in range improvement and in raising the yield of seed; some recommendations are made for further development on these lines.

L. H. Zimmerman writes on Castorbeans: a new oil crop for mechanized production. After an introduction showing its increased importance as an industrial crop, a botanical description is given of *Ricinus communis*, followed by an outline of existing knowledge on the cytology, genetics and breeding, a certain amount of unpublished work being reported as well as a review of data appearing in the literature. Descriptions of the main varieties grown in the USA include several hybrids. The seed yields of three hybrid varieties were 109–130% of those of the respective higher-yielding parent in 1953, 1955 and 1956, the increase being produced mainly by a greater number of seeds and to a lesser extent by greater seed weight. Three-way crosses were roughly equal to these hybrids in seed yield but produced a certain number of giant plants, not suited to mechanized production. Yields of up to 3500 lb. of seed per acre have been obtained from the commercial hybrid Pacific Hybrid 6. Some dwarf-internode hybrids are now being introduced for windy areas.

Another oil-seed crop to receive attention is safflower, dealt with by P. F. Knowles. Information is given on the extent of its cultivation in different countries, the botanical characteristics of *Carthamus tinctorius*, the extent of natural crossing, artificial hybridization, properties of the seed and the occurrence of sterility. There follows a section on cytotaxonomy. All cultivated safflowers examined had 12 pairs of chromosomes, except for one trisomic from Morocco; several other species also have $2n = 24$, though some of them cross with *C. tinctorius* and some do not. Other groups of species have $2n = 20$, 44 and 64. Doubt apparently remains concerning which species represent the most probable ancestors of cultivated safflower. Reference is made to hybridizations that have been carried out in efforts to increase earliness, resistance to rust (*Puccinia carthami*), root rot (*Phytophthora drechsleri*), leaf spot (*Alternaria carthami*) and certain other diseases, and to frost. It is pointed out that most of the improved varieties in the USA have been derived from introductions from Egypt and those from India have been less successful. As a result of breeding work in the last fifteen years there has been an increase of 20% in oil content and an equal rise in the yielding ability.

In New grasses and legumes for soil and water conservation, A. L. Hafenrichter gives a full account of the extensive programme of testing and introduction of new forms of herbage plants for the purposes of soil conservation in various areas of the USA, the special requirements of which are analysed. The new forms described include improved varieties of established species and a number of new species not previously grown widely.

2115 STEINHAUS, E. A. (Editor)
Annual Review of Entomology. Vol. 3.
Annual Reviews, Inc., Palo Alto, California 1958 : $7.50 : Pp. vii + 520 : figs. : tables.

The third volume of this useful series [cf. XXVII, p. 395] again contains matter of interest to plant breeders as well as entomologists. R. H. Painter contributes a review on Resistance of plants to insects, covering the period from 1951 to May 1957. The review includes information received in reply to a questionnaire on sources of resistance circulated to laboratories known to be working on the subject in the USA; this limitation of the scope of the enquiry deprives the results of any general significance, though a few points of general interest emerge; one is the extent of the attention given to resistance to the spotted aphid in lucerne, Hessian fly in wheat and earworm and corn borer in maize. A list is given of some 30–50 varieties of crop plants resistant to some insect or other that are being grown at present in the USA. The information presented concerning other countries is decidedly scanty. Figures are provided showing the reduction in insect populations resulting from the use of resistant varieties of various plants. In reviewing the literature on the nature of insect resistance it is suggested that more use should be made of isogenic pairs differing only in resistance and susceptibility. Certain studies on the inheritance of resistance are reviewed and in the concluding remarks it is pointed out that the basis of resistance is "proving to be more complex than many have thought it to be", and that combined resistance to more than one insect seems to be the exception rather than the rule. This contribution, both in the text and the appended bibliography, would have benefited by rather more careful editing.

In Dynamics of insect populations, A. J. Nicholson analyses the evidence for the existence and universal operation of density-governed reaction in population control in insects; various criticisms of it, together with any alternative mechanisms so far put forward, are considered to be unconvincing.

Among the other contributions to the volume those of possible interest to plant breeders or geneticists include the reviews on the nutritional requirements of phytophagous insects, genetics and breeding of the honey bee, hybridization and speciation in mosquitoes, and the phylogeny of the panorpoid orders.

2116 ROEMER, T. & RUDORF, W. (Editors)
Handbuch der Pflanzenzüchtung.
(Manual of plant breeding).
Paul Parey, Berlin & Hamburg 1956 : 2nd. Ed. : Lief. 21 : Vo. 2 : Bogen 26–30 : 401–80; Lief. 22 : Vo. 3 : Bogen 16–20 : 241–320; Lief. 23 : Vol. 3 : Bogen 21–22 : 321–51 + xviii; Lief. 24 : Vol. 2 : Bogen 31–35 : 481–560; Lief. 25 : Vol. 4 : Bogen 6–10 : 81–160 : figs. : tables : DM 13.50.

Instalment 21 [cf. XXVIII, 3573] completes the section on barley in volume 2, with chapters devoted respectively to breeding forage barleys and diagnostic characters used in varietal identification. Next comes the first part of Hafer (*Avena sativa* L.) [Oats (*A. sativa* L.)] by F. A. Coffman and J. Mac Key, the former surveying the literature on systematics, origin, cytology, diseases and genetics of resistance and breeding in North America; the second dealing with morphology and genetics. Instalment 22 completes the section on beets in volume 3: the survey of diseases for which resistant varieties are bred is completed and there follows a description of the various breeding methods employed in the improvement of beets. K. J. Frandsen writes on Breeding forage beets, this being the expression used to denote what in the United Kingdom are referred to as mangels; there are chapters on floral biology, variability, heredity, breeding systems, breeding polyploid forms and breeding results. The beginning of Breeding of swede (*Brassica Napus* var. *rapifera*) by K. J. Frandsen also appears in this instalment, the chapters included being those on floral biology, technique of selfing and crossing, effect of inbreeding and outbreeding, variability, correlation of characters and heredity. This section is continued in Instalment 23, with chapters on disease resistance, frost resistance, polyploids and results of breeding. Next comes Topinambur, *Helianthus tuberosus* L. [Jerusalem artichoke, *H. tuberosus* L.] by W. Rudorf; there are chapters on systematics and origin, cytology, floral biology and technique of hybridization and breeding methods, with an analysis of the various characters that have been improved by breeding. The instalment is completed by title pages, subject index, table of contents, preface and list of contents.

Instalment 24 completes the section on oats in volume 2, with chapters on the genetics of some agronomic characters and on oat breeding. Next comes the beginning of *Panicum*- and *Setaria*-Hirsen (einschliesslich *Echinochloa* und *Digitaria*) [*Panicum* and *Setaria* millets (including *Echinochloa* and *Digitaria*)] by A. Scheibe; there are chapters on systematics, origin, distribution of forms, cytology and compatibility, floral biology, crossing and the results of breeding.

Instalment 25 continues the section on vetches in volume 4, dealing with breeding methods, objectives and results in *Vicia sativa*. Winter vetch (*V. villosa*) is then treated on similar lines and there follow short sections devoted to *V. pannonica* and a number of other species. The next section is on Futtererbsen, *Pisum sativum* L. *sensu lat.* Gov., ssp. *Pisum sativum* [Field peas, *P. sativum* L. *sensu lat.* Gov., ssp. *Pisum sativum*] by W. Hertsch, who writes on systematics, origin, floral biology and hybridization, variability and inheritance of economic characters, breeding methods and breeding results. The group of plants referred to as Kleeartige Futterpflanzen [Cloverlike fodder plants] form the subject of the next part of volume 4. The first section is Luzerne-Arten [Lucerne species] by W. M. Myers and W. Rudorf, writing respectively in English and German; Rudorf deals with systematics, cytology, interspecific and intergeneric hybrids and centres of origin of the different species; Myers writes on biology of flowering, self and cross fertility and the technique of selfing and crossing; Rudorf then deals with form diversity and variability of economic characters.

2117 Randhawa, M. S.
Agriculture and animal husbandry in India.
Indian Council of Agricultural Research, New Delhi 1958 : Rs. 15.00 : Pp. xvi + 364 : 58 figs. : 15 tables : 58 plates.

As the author tells us in the preface, when he joined the Indian Council of Agricultural Research as its Vice-President in October 1955, he made a request for a book which could provide him with information on the production and improved varieties of the chief crops in India, as well as breeds of farm animals. Although a book of this nature was not available, he found sufficient material in various bulletins and reports and arrived at the conclusion that its compilation in the form of a reference book would be worth while, the present work being the result of this idea. All those interested in Indian agriculture, and particularly in crop improvement, will be grateful to the author for compiling this useful survey and sparing them the effort of consulting a large number of publications. Intended primarily for administrators and agricultural officers, teachers and students, it contains three main sections. The first, entitled The land, deals with geology, soils, climate, vegetational types, crop production and animal husbandry on a geographical basis, agricultural holdings and irrigation. The second section, forming the greater proportion of the volume, is concerned with the cultivation and improved varieties of food, oilseed, fibre and plantation and other crops in thirty-six chapters. The final section deals with farm animals, poultry and fish. Statistical tables giving miscellaneous information, a bibliography and index complete the survey.

2118 Ruhland, W.
Handbuch der Pflanzenphysiologie. (**Encyclopedia of plant physiology**).
Springer-Verlag, Berlin 1958 : DM 198 : Pp. xiv + 834 : figs. : tables.

The above publication is the tenth of a series of eighteen volumes forming a detailed review of all aspects of plant physiology [cf. XXVI, p. 525 and XXIX, p. 160].

This volume is concerned with the metabolism of secondary plant products. It is divided into sections dealing with the following subjects: Die Terpenoide [Terpenoids]; Wachs, Cutin, Kork [Wax, cutin, cork]; Anthocyanins, flavones, xanthones; Pflanzengerbstoffe [Plant tannins]; Lignins and lignification; Hydroaromatische Verbindungen und weitere Benzolderivate [Hydroaromatic compounds and other benzene derivatives] and Especial compounds of lichens. As with other volumes in the series, each section contains one or more essays by authorities in the fields concerned.

Some authors deal with subjects of particular interest to geneticists. Goodwin in his contribution on Carotenoids provides an account of studies on the genetical control of carotenoid formation. Work on the tomato is reviewed in some detail, a brief mention being also made of investigations with other crops including maize. Studies of carotenoid-deficient mutants of lower plants such as *Neurospora* are discussed in relation to theories of carotenoid biosynthesis. Blank, writing on Anthocyanins, flavones and xanthones, deals briefly with the genetical control of the formation of flavonoid compounds, reference being made to studies of flower colour. In a contribution on the Metabolism of aromatic compounds by lower plants, Evans mentions work in which biochemically-deficient mutant strains have been used to study the sequence of reactions in various biosyntheses.

The formulae for most of the more complicated substances mentioned in the text are neatly portrayed; there are also many other useful illustrations and clear tabulations of data.

A full bibliography follows the contribution of each author and the book is provided with an author index and good subject indexes in English and German. A vast amount of information has been brought together to make a valuable reference book.

2119 Handbuch der Pflanzenkrankheiten. Band V. Tierische Schädlinge an Nutzpflanzen, 2. Teil. (**Handbook of plant diseases. Vol. 5. Animal pests of economic plants. Part 2**).
Paul Parey, Berlin and Hamburg 1957 : 4th Ed. : DM 147 : Pp. 577 : 257 figs.

The remarks made concerning the new edition of volume 1 of this familiar work [cf. VI, p. 332] apply *a fortiori* to the revised edition of Vol. 5, the second part of which is devoted to pests belonging to the Aphidina and Coccoidea of the Homoptera. Again the size has more than doubled, the number of pages of text having risen from 200 in the 1932 edition to 520 in the new. To this must be added a glossary and a very comprehensive subject index. The arrangement is the same as in the previous editions, data being given concerning common as well as Latin names, geographical distribution, host plants, mode of reproduction and life cycle, as well as the damage caused by each pest and the chief methods of control. The photographic illustrations and diagrams are all new and of the usual high standard associated with this publisher. There is an introductory section dealing with the general biology of the two groups, including a brief section on resistance and immunity, their nature and inheritance, and the breeding of resistant varieties. Here the necessity for careful studies of the genetic relationships in both host and parasite is emphasized: the majority, if not all, of the cases of so-called aggressive mutants of the parasite, both in fungi and insects, are, it is affirmed, explicable on the basis of segregation in the parasite.

2120 Wallace, H. A. & Brown, W. L.
Corn and its early fathers.
The Michigan State University Press 1956 : $3.75 : Pp. xi + 134 : 27 figs.

As this popular but informative and stimulating book shows, hybrid maize has indeed had many originators who, as amateurs, trained scientists, breeders or even ordinary farmers, have played diverse parts in bringing about one of the greatest agricultural improvements of this century. After a shaky start in the first chapter, in which the characteristics and mode of reproduction of the plant are all-too-brightly described for the instruction of the nonbotanist and in which we come across such statements as "The ovules and silks are the female element, just as the pollen is the male element," and in the second chapter in which the role of maize in the rise of American civilization is outlined with patriotic fervour and the special merits and method of producing hybrid maize receive a brief but high-powered explanation, the book settles down to a readable and less breathless account of the early history of the crop and of the development of hybrid varieties. Beginning with an account of maize before colonization, which clearly brings out the significance of the basic improvement achieved by the American Indians, the authors tell the story of the pioneer studies carried out on the mode of reproduction by James Logan and others in the eighteenth century, breeding by farmers such as John Lorain during the period 1780–1850, the work of Darwin on cross and self fertilization in plants and his experimental observation of hybrid vigour in maize in 1871, Beals's intervarietal hybridization, the development of improved varieties by Robert and James Reid, Krug and Hershey, the propagandist work of P. G. Holden among farmers at the beginning of the century to promote the extensive use of Reid's Yellow Dent, shows and early yield tests, Mendel's discovery, and, finally, the establishment of the genetical foundations of modern maize breeding by Shull, East, Hayes and Jones. Throughout, relevant biographical details are included. The contributions made by the individuals concerned are on the whole fairly assessed. The book concludes with a chapter entitled Small gardens and big ideas, and another on Forgotten corns. In the former, the current approach of "doing things in a big way" on an increasingly complicated statistical basis in maize research and breeding in America is contrasted with the limited experimental resources with which the early investigators made their far-reaching discoveries and is criticized as a tendency to exalt quantity at the expense of quality. In the latter chapter the importance of preserving unusual and little-used types as sources of germ plasm is emphasized and some of the characters which may have to be sought among them in the future are indicated.

2121 Aufhammer, G., Bergal, P. & Horne, F. R.
Barley varieties—EBC.
D. Van Nostrand Company Ltd. London & Elsevier Publishing Company, Amsterdam 1958 : 2nd Ed. : 30s. : Pp. xvi + 159 : figs. : plates.

The second edition of this catalogue [cf. XXV, p. 272] provides descriptions of some forty malting varieties which are important in one or more European countries, information in each case being given on origin, breeder, characters of the ear and grain, vegetative and agronomic characters and grain qualities. For each variety, the descriptive notes are supplemented by photographs of the ear and grain. Useful charts indicating the relationships between the pedigrees of the more important varieties in Denmark, Germany, France, Holland, Sweden and the United Kingdom are included. The second edition follows the first in that English, French and German versions of the descriptions are given. As in the case of the earlier work, information on diagnostic botanical characters has been based chiefly on observations on the varieties at the National Institute of Agricultural Botany, Cambridge, England. Vegetative and agronomic characters and grain qualities refer to performance in the country in which the variety was bred. The catalogue is to be kept up to date in the following way. Each year a supplement is to be issued containing descriptions of any new varieties which have successfully completed three years in the Barley Committee trials, or whose cultivation has risen above an acreage of about 5% in one or more countries.

2122 Hallsworth, E. G. (Editor)
Nutrition of the legumes.
Butterworths Scientific Publications, London 1958 : 55s. : Pp. x + 359 : figs. : tables.

The Fifth Easter School in Agricultural Science, held at the University of Nottingham in 1958 [cf. XXVIII, p. 413], was devoted to legume nutrition and the proceedings contain, in addition to much information of general interest, the following items which will appeal directly or indirectly to geneticists. In Classification of the legumes, Prof. T. G. Tutin gives a useful outline of the taxonomy of this extensive group; a description of the many tribes that comprise it serves to illustrate the wide variation of structure and uses encountered in the group. The whole range of the present-day forms is thought to have evolved from a tropical tree type with unspecialized flowers, large fleshy fruits and black arillate seeds; the chief trends in the supposed evolutionary sequence are indicated.

The classification of the rhizobia was treated by H. L. Jensen, who pointed out some of the difficulties in effecting any classification at all in this very variable group of microorganisms: even the cross-inoculation groups have been bedevilled by numerous cases of "promiscuity". The most efficient mode of classification so far seems to be that based on serological groupings, though it cuts sweepingly across the cultural and fermentative characters. It is suggested that further surprises are probably in store when the rhizobial groups are subjected to genetic analysis. In the discussion some scepticism was expressed concerning claims by Bisset that a certain stage of rhizobia yields gram-positive bacilli which produce endospores.

P. S. Nutman spoke on The physiology of nodule formation, and P. Manil on The legume-rhizobia symbiosis; the latter speaker discussed the possible existence of genetic peculiarities in the Leguminosae making them predisposed to symbiosis with this particular group of bacteria, reaching the conclusion that "in the present state of knowledge, we cannot explain with any certainty the reason why *Rhizobium* symbiosis is restricted to legume species".

In a contribution entitled Symbiotic nitrogen fixation by non-legumes, G. Bond gave an account of observations on nitrogen fixation in some 190 species belonging to the genera *Alnus, Myrica, Hippophae, Elaeagnus, Shepherdia, Ceanothus, Coriaria* and *Casuarina*. Most, if not all, produce nodules, the structure of which is described, and data are presented which indicate that nitrogen fixation is performed by the symbiotic organisms in these nodules in a manner and in quantities similar to that in *Rhizobium* nodules in legumes. It is thought probable that the power of colonization and the spread of certain plants such as *Hippophae, Shepherdia* and *Alnus* in postglacial periods is due to their power of nitrogen fixation.

In Recent Belgian studies on symbiosis, P. Manil described some experiments in which plants of *Trifolium ambiguum*, which does not normally produce nodules, were induced to do so by grafting with *T. repens*. Isolations from the induced nodules proved to be true species of *Rhizobium*. Reference was made to experiments in which treatment with colchicine increased the amount of nodulation in roots of lucerne and red clover. Other factors affecting nodulation are plant vigour, photoperiod and pH.

2123 ERNOULD, L. & VAN STEYVOORT, L.
Atlas des ennemis et maladies de la betterave. (**An atlas of the pests and diseases of beet**).
Institut Belge pour l'Amélioration de la Betterave, Tirlemont 1958 : 2nd Ed. : Pp. 70 : 30 plates.

The first edition of this attractive little book produced by the Belgian Institute for the Improvement of Beet appeared in 1938; it has now been revised to take into account recent developments in pest control. Primarily intended for beet growers, this book provides concise descriptive notes on physiological disorders caused by unfavourable weather and soil conditions, diseases resulting from attack by microorganisms, fungi and insects and damage caused by other animals. In most cases beautiful colour plates illustrating the symptoms are conveniently placed on the page opposite to the relevant text; photographs of the insect pests are also included. Practical information is provided on preventative and curative measures of control; pesticides are recommended, details being given of suitable rates of application. A key for identifying the disorders precedes the main part of the book, which is concluded by an index to the pests and diseases mentioned. This handbook should be of considerable value to growers.

2124 PEARSON, E. O.
The insect pests of cotton in tropical Africa.
Empire Cotton Growing Corporation and Commonwealth Institute of Entomology, London 1958 : 40s. : Pp. x + 355 : 16 figs. : 15 tables : 8 plates.

This book deals with the insects associated with cotton in Africa south of the Sahara. Its object is not only to give an account of them which will be useful to those concerned with the welfare of the crop but who are not entomologists, but also to provide the specialist working on African cotton-pest problems with a critical summary of the available information. Now Director of the Commonwealth Institute of Entomology and formerly Senior Entomologist, Empire Cotton Growing Corporation, the author has worked mainly in southern, central and east Africa, but on visits has also studied the insect problems of cotton growing in Aden, the Belgian Congo, French Equatorial and French West Africa, Ghana, Mozambique, Nigeria and the Sudan. The book is therefore based on an unusually wide range of entomological experience.

The work begins with two introductory sections. The first, entitled Cotton-growing in tropical Africa, deals briefly with the botany of the cotton plant, the characteristics and origin of the cultivated cottons, wild representatives of *Gossypium* in Africa, early introductions of cultivated cotton, the basis of the modern commercial crop, organization and methods of cultivation and the principal cotton-growing areas in the region in question. The second comprises a general account of the pests as regards the systematic groups to which they belong, their geographical distribution and the nature of their association with cotton, together with a summary of information on the identity of the insects and diseases affecting the various parts of the plant under African conditions, and a discussion of the effects of insect attack on yield. Brief notes are given on each of the cotton-growing areas in tropical Africa and their principal pests. A revised form of an existing key to the chief disorders of cotton in Africa is included. It is based on symptoms visible in the field and, in cases where an insect is concerned, should guide the nonspecialist to the appropriate later section. The main part consists of an account of each of the chief pests or group of pests, arranged, broadly speaking, according to the following pattern: taxonomy and distribution, description of the different stages, life history and seasonal activity, nature of the damage inflicted on cotton, alternative hosts, natural enemies, factors affecting prevalence, and control. As the writer explains in the introduction, at the time of beginning to compile the work, insecticides had been used hardly anywhere on a commercial scale against cotton pests in tropical Africa, except for a short time in the Sudan. Developments in the Sudan have since been so rapid and have raised many issues which are still in some doubt that the author, feeling he could not deal adequately with chemical control measures, has mentioned them only briefly and has instead called upon R. C. Maxwell Darling, who has been intimately associated with the development of the use of insecticides in cotton production in the Sudan, to contribute an interim appraisal of the subject as an appendix. Coloured plates, a bibliography of 686 references and an index complete a valuable work of reference. Prof. J. W. Munro contributes the foreword.

2125 Knight, R. L., & Keep, E.
Abstract bibliography of fruit breeding and genetics to 1955. *Rubus* and *Ribes*—a survey.
Tech. Comm. Commonw. Bur. Hort. 1958 : No. 25 : 45s. : Pp. 254.

Arranged alphabetically according to authors, this abstract bibliography deals almost exclusively with literature published between 1900 and 1955, although a few items of earlier date have been incorporated. The crops covered are currants, gooseberries, raspberries, blackberries and hybrid berries. Papers and reports concerned with the breeding, genetics and cytology of *Rubus* and *Ribes* are summarized in detail. The compilers have also extended their field to pomological descriptions, the classification and synonymy of varieties and species, and reactions to diseases and pests. Papers dealing solely with the systematic botany of the two genera have been included by title only. Appendices give a gene list for *Rubus* spp. and information on gene linkages in *Rubus idaeus*. The detailed index includes the names of commercial varieties.

2126 Röhrig, E.
Die Anzucht von Forstpflanzen in Nadelstreubeeten. (**Raising forest plants in beds of conifer leaf mould**).
SchrReihe. Forstl. Fak. Univ. Göttingen 1958 : **22** : DM 6.40 : Pp. 49 : 2 figs. : 36 tables.

Foresters who grow their own seed should have the satisfaction that their planting material is fresh, healthy and true to type. The advantages of raising the seedlings in beds of conifer leaf mould have been examined by analysing the results of experiments carried out by forest officers and others in different parts of Germany, combined with those of the author's own experiments. The results, presented in this small volume, show that the seedlings grown in conifer leaf mould were larger and more vigorous than those grown in mineral soil, in both the first and second year of growth.

2127 Messer, H.
Das Fruchten der Waldbäume als Grundlage der Forstsamengewinnung. I. Koniferen. (**Fruit bearing of forest trees as the basis of seed production in forestry. I. Conifers**).
Mitt. Hess. LandForstverwalt. 1958 : **1** : DM 11.00 : Pp. 108 : 24 figs. : 37 tables.

Reafforestation having been neglected in Germany during the war and post-war years, considerable attention is being given to it now and the problem of seed supplies is assuming particular importance. A study has been made of seed production in the main coniferous species grown in Germany and the results, together with information collected from the literature, are conveniently presented in this small volume.

Details are given on the development of the cone and the ripening of the seeds. The species differ in the time taken for the seeds to reach their full germinating capacity; pine and larch seeds can reach this under favourable circumstance by late September or early October, spruce by early September, fir by mid-September, Douglas fir by mid-August and *Pinus strobus* by early August.

The change in colour of the seed is a fairly reliable guide to its maturity but a better criterion is the water content of the cones, which in pine, spruce and larch should be under 40% before they are picked, in Douglas fir and *P. strobus* under 50% and in fir under 60%; if kept in a suitable dry store their seeds will then germinate satisfactorily.

Measurements of seed yield showed that this was greatest in the most vigorous trees, so that positive selection for vigour and height is exerted when seed is collected from growing trees. For this reason this method of collection is recommended. It is calculated that the area of possible seed producers in all the above species is very much greater than that required to meet the requirements of the whole of Federal Germany, in consequence of which a very high degree of selection can be exercised. Hereditary differences between individual trees have been observed in respect of the proportion of good seeds produced.

Though pines were collected in all parts of Federal Germany no morphological or other differences could be detected between the cones from different localities, though the seed size was lower in material from high altitudes.

2128 Cook, A. H. (Editor)
The chemistry and biology of yeasts.
Academic Press Inc., New York & Academic Books Ltd., London 1958 : $22.00 : Pp. xii + 763 : figs. : tables.

This handsome and expensive volume has been produced with the aim of providing a single, comprehensive and up-to-date source of information on the more important findings of yeast research. There are thirteen chapters, each dealing with different aspects of the study of yeasts and each contributed by different workers. The chapters most likely to be of interest to readers of *Plant Breeding Abstracts* are those on the Life history and cytology of yeasts and Yeast genetics, both by Ö. Winge and C. Roberts. In the first of these, after an outline of the discovery of and later work on the alternation of generations in yeasts, variations in the life cycle are discussed together with the part played by heterothallism. The final sections on cytology and polyploidy emphasize how controversial are the views of many workers on the structure and behaviour of the chromosomes in yeasts. The authors point out that "even though many investigators claim to have demonstrated the existence of polyploidy in yeasts, it should be remembered that so-called polyploid segregation may be explicable on the basis of supernumerary mitoses and binucleate spores," and further that, unless haploid yeasts possess only one chromosome, which the most careful observations indicate is not so, then it cannot be expected that a tetraploid ascus should regularly give four diploid spores or a triploid ascus two haploid and two diploid, but that, on the contrary, aneuploids should be frequent.

In their chapter on genetics the topics discussed are: techniques of spore isolation and hybridization; Mendelian segregation; complementary gene action; the importance of adequately identifying the genotype; irregular segregation; linkage and interallelic crossing over; mutation and variation; and cytoplasmic inheritance. In the section on irregular segregation, the importance of taking into account the effects of polymeric genes, the overlapping of generations and the occurrence of supernumerary mitoses upon segregation ratios is emphasized.

The following form the remaining eleven chapters: The classification of yeasts, by J. Lodder, W. C. Slooff and N. J. W. Kreger - van Rij; Ecology of yeasts, by A. Lund; Aspects of the chemical composition of yeast, by A. A. Eddy; Yeast growth, by E. O. Morris; Fermentation and precipitation, by F. F. Nord and S. Weiss; Synthesis and degradation of cellular carbohydrates by yeasts, by W. E. Trevelyan; Nitrogen metabolism, by G. Harris; The technology of yeast, by M. Pyke; Pathogenic yeasts, by G. C. Ainsworth; Yeasts in food spoilage, by M. Ingram; and Flocculation of yeasts by H. E. Jansen, which includes a section on the genetics of flocculation.

NEW JOURNALS

Horticultural Advance.

The fields covered by papers in the first issue of this journal are vegetative propagation, biennial bearing, breeding, ripening, disease control and mineral deficiency of mangos; dehydration of litchis; reproductive flushes in loquat; disease and insect control in persimmon, plums and other fruits; floral biology in *Luffa* and studies on the preparation of papain. The journal is published by the Horticultural Research Institute, Saharanpur, Uttar Pradesh, India, and may be obtained from the editor at that address.

The Nucleus.

This journal, the first number of which appeared in June 1958, is to be issued twice a year. Original and review articles on cytology, cytochemistry and allied subjects will be published. The annual subscription is Rs. 46/- and further information may be obtained from Dr. A. K. Sharma, Cytogenetics Laboratory, Department of Botany, University of Calcutta, 33, Ballygunge Circular Road, Calcutta 19. Dr. A. K. Sharma is both editor and publisher of the journal.

Report, Lafayette, Indiana.

Intended as a means of furthering the work of the Agricultural Extension Service of Indiana, this quarterly magazine contains popular articles reporting advances in research in agriculture and home economics at Purdue University. It includes articles on crop breeding. Further details may be obtained from the Department of Agricultural Information, Purdue University, Lafayette, Ind.

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